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Vol. VII, No. 1, pp. 1-9 April-June 1978

# MORPHOLOGICAL AND MATING SYSTEM STUDIES OF A NEW TAXON OF *HERICIUM* (APHYLLOPHORALES, HERICIACEAE) FROM THE SOUTHERN APPALACHIANS

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and K. A. Nishijima

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## SUMMARY

A new subspecies, *Hericium erinaceum* ssp. *erinaceo-abietis*, is described and illustrated. It is interfertile with *H. erinaceum* and *H. abeitis*.

---

Recently, a collection (OKM 15159) of an unusual (seemingly aborted) hydnaceous basidiocarp was found in the mountains of central Virginia. The morphological characters of the specimen indicate it represents a member of the genus *Hericium* Pers. per S. F. Gray but unlike any with which we are acquainted. The four North American species recognized by Harrison (1973) are *H. abietis* (Wier ex Hubert) K. Harrison, *H. erinaceum* (Bull. per Fr.) Pers., *H. coralloides* (Scop. per Fr.) S. F. Gray, and *H. ramosum* (Bull. per Mérat) Letellier. Our comparison of this "aborted" specimen with the descriptions of these indicated that it was different macroscopically from all of them. It is most like *H. erinaceum* in micromorphology and habitat. Basidiocarps of *H. erinaceum* are generally large, white, densely hirsute, oval to irregularly shaped masses of fungal tissue with pendent teeth up to 3 cm long, but the unusual specimen recently found (Fig. 1) is smaller, irregularly swollen, and has minute teeth (Fig. 2) covering the irregularly shaped basidiocarp.

①

②

Polyspore cultures were obtained from specimen OKM 15159, and single spore isolates were obtained when this isolate fruited in culture. The mating system is tetrapolar and multiple allelic as in *Hericium* species, with the four mating types distributed as follows:

| | |
|---|---|
| $A_1B_1$ | 1,4,10,11,14,17,18,48,50,53 |
| $A_2B_2$ | 2,3,5,12,13,15,16,51 |
| $A_1B_2$ | 6,8,9,20,46,49,52 |
| $A_2B_1$ | 7,19,47 |

To determine if any of the four North American species (none of which are interfertile according to our studies) are interfertile with OKM 15159, single spore isolates were paired with those derived from at least two different basidiocarps of each of the four species, often from different parts of the U.S.A. Such pairings between OKM 15159 and *H. ramosum* and OKM 15159 and *H. coralloides* indicated that the isolates were incompatible because clamp connections were not formed.

The pairings between OKM 15159 single spore isolates and those of *H. erinaceum* [from Maryland (OKM 4950) and Arizona (JPL 317)] were totally compatible. Similar pairings between OKM 15159 single spore isolates and those from three different collections of *H. abietis* (a species found only in the northwestern U.S. and western Canada), however, showed partial, but not complete, compatibility as expressed by clamp connection formation. The possibility that OKM 15159 was a hybrid of *H. erinaceum* x *H. abietis* was considered but in no case were clamp connections formed when single spore isolates of these two species were paired. We have not yet, however, attempted pairings between single spore isolates of *H. abietis* and those from *H. erinaceum* specimens from the Northwest. Such studies will be carried out when isolates of the northwestern *H. erinaceum* specimens are available.

Nuclear staining (using the method of Morgan-Jones and Hulton, 1974) was then conducted to determine whether clamp connection formation in the crosses between OKM 15159 and *H. erinaceum* and between OKM 15159 and *H. abietis* resulted

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Figs. 1-2. *H. erinaceum* subsp. *erinaceo-abietis* basidiocarp, OKM 15159, Fig. 1, x 1. Fig. 2, x 3.

in dikaryon formation. In pairings where clamp connections were formed the dikaryon condition was established and maintained.

Available distribution data indicate that the geographic isolation of OKM 15159 (from eastern U.S.A.) from *H. abietis* (from western U.S.A.) is complete. The isolation of OKM 15159 from *H. erinaceum* is apparently lacking. The Virginia specimen is obviously very closely related to both species but maintains a degree of distinctness as indicated by the morphology, growth in culture, and mating interactions.

Because of the differences in morphological, cultural, and mating interactions found in OKM 15159, we erect here a new subspecies of *H. erinaceum.*

*Hericium erinaceum* (Bull. per Fr.) Pers. subsp. *erinaceo-abietis* subsp. nov. Figs 1-10.

A *Hericio erinaceo* typica basidiocarpis similiter sed irregularis nodulosis; dentibus usque ad 3 mm longos; hyphis trama clentibus tunicatis tenuibus; tetrapolaribus; interfertilibus *H. erinaceo* et *H. abieti.*

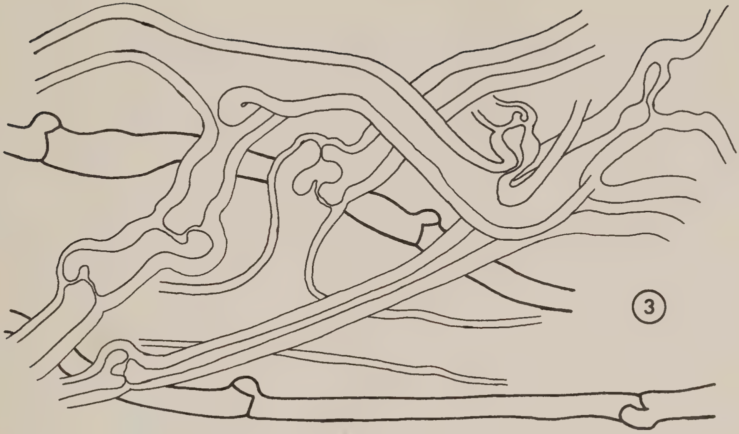
Holotypus-OKM 15159, on living *Quercus* sp. (oak), Carvins Cove, Hollins, Roanoke County, Virginia, U.S.A., October 4, 1975, Coll. Joseph Deutsch. In herb. CFMR conservatum. Isotypus in herb. VPI conservatum.

Basidiocarp (Figs. 1 and 2) up to 12 x 10 x 5 cm, irregularly shaped masses of tissue with swellings forming a nodulose surface, white, firm to tough; teeth covering surface, white; 3(-4) mm long, 0.5 mm thick, subulate; context white, spore print white.

Hyphal system monomitic; contextual hyphae (Fig. 3) 5-9 µm diam, hyaline, thick-walled (walls up to 3 µm thick), smooth, septate with clamp connections, regularly branched, rarely with only slight wall thickening, these densely staining in phloxine, walls blue in Melzer's reagent;

---

Figs. 3-7. Line drawings of microscopic structures in basidiocarp of *H. erinaceum* subsp. *erinaceo-abietis* (OKM 15159) 3. contextual hyphae. 4. hyphae of tooth trama. 5. cystidia with globular and granular content. 6. basidiospores. 7. basidia.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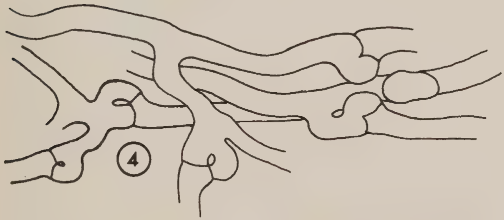
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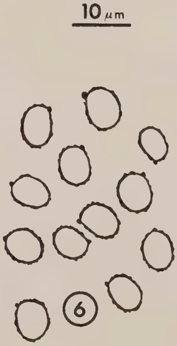

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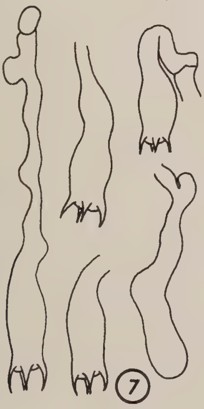
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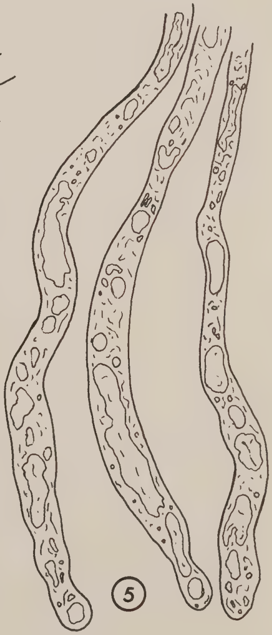
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tooth trama a textura porrecta, hyphae (Fig. 4) mostly 3-4 µm diam, rarely up to 10 µm diam, thin-walled or with slight wall thickening, hyaline, smooth, septate with clamp connections, branching regularly, scattered intercalary thick-walled (walls up to 1 µm thick) cells present, ovoid to irregularly elongate, hyaline, smooth; subhymenium poorly delimited, composed mainly of cystidia oriented parallel to axis of tooth, these turn outward into hymenial layer; cystidia (Fig. 5) 75-150 x 6-9 µm, cylindrical, thin-walled, clavate or moniliform, often with small apical bead or papilla, smooth, with dense granular and/or globular content, not reacting with sulfuric benzaldehyde; basidia (Fig. 7) rare, difficult to observe, of variable length, up to 60 x 5-6 µm, hyaline, thin-walled, clamped at basal septum, mostly 4 spored, basidiospores (Fig. 6) 6-7.5 x 4.5-5.5 (-6) µm, broadly ovoid, hyaline to pale yellow under microscope, with thickened walls (walls up to 1 µm thick), smooth to slightly granulose, dark blue to black in Melzer's reagent, no color change in lactophenol analine blue.

Specimen examined: Holotype, noted above.

Etymology: From the specific epithets *erinaceum* and *abietis*, the two species with which it is interfertile.

## CULTURAL CHARACTERS

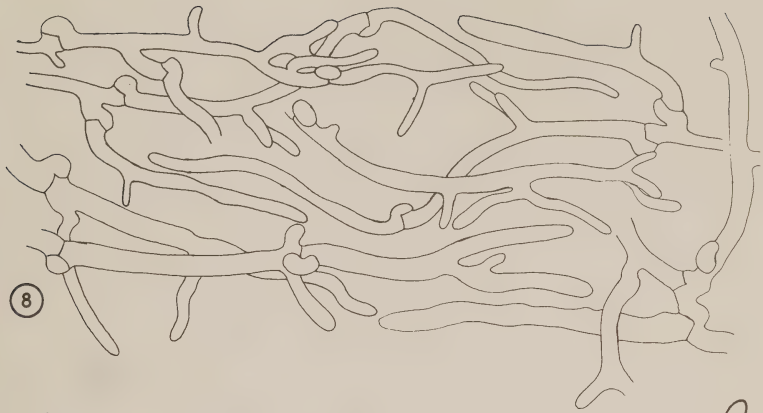
Key Pattern (using Davidson et al. (1942) method). A-P-S-1-2-10-14-16. Species Code (using Nobles (1965) method). 2.3.15.27[1/].34.36.38.44.45.48.54.60.

*Growth Characteristics:* Growth on 1.5% malt extract agar at 25 C slow, 18-25 mm radius in 14 days; mat white, appressed, with sparse woolly aerial white threads, most

---

[1/] Nobles (1965) left numbers 27-33 of her species code system available for future characters. We are using 27 to indicate the presence of normal cylindrical thick-walled hyphae with clamp connections at septa. None of the numbers presently used indicate the presence of such hyphae.

Figs. 8-10. Line drawings of microscope structures in cultures of *H. erinaceum* subsp. *erinaceo-abietis* (OKM 15159). 8. hyphae of margin. 9. aerial hyphae with occasional intercalary and terminal thick-walled swollen cells. 10. submerged hyphae.



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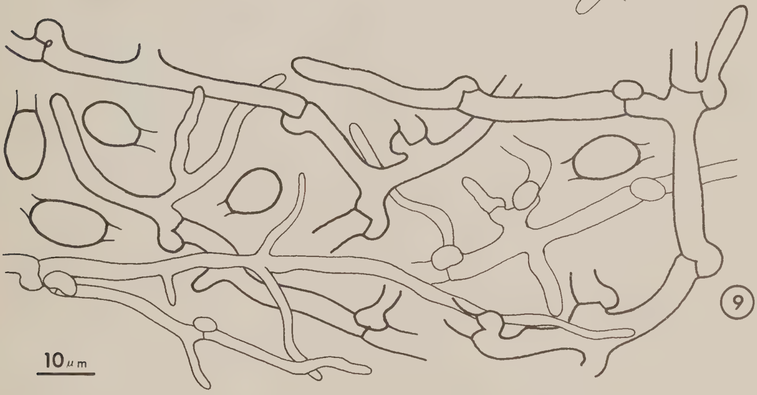

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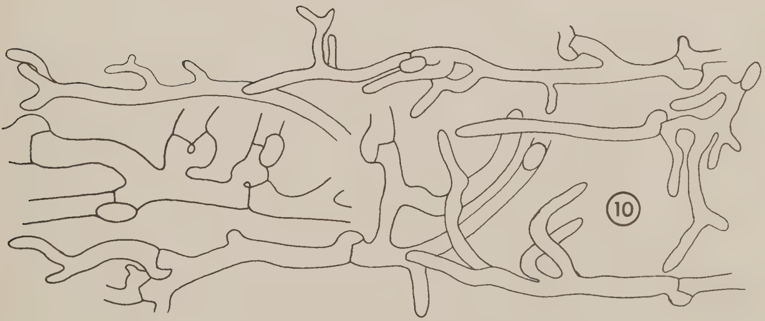

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growth submerged with aerial and submerged hyphae growing at about equal rates, advancing margin irregular, fimbriate; agar not bleached; odor none; after about 2 weeks clusters of small, smooth, white, circular, slightly raised areas up to 1 mm diam form on mat surface, these eventually coalesce, fruiting body sometimes forming in 6 weeks; reaction zone on both gallic acid agar and tannic acid agar weak to strong, up to 15 mm diam in 7 days, no growth on either medium.

*Hyphal Characteristics:* Margin hyphae (Fig. 8) 2.0-4.0 µm diam, hyaline, thin-walled, smooth, much branched, clamped at all septa; aerial hyphae (Fig. 9) 2.0-5.5 µm diam, hyaline to pale yellow, smooth, thin-walled or walls up to slightly less than 1 µm thick, much branched, clamped at all septa; in crustose areas hyphae like those in other areas but densely encrusted with yellow needle-shaped crystals which form large irregularly shaped clusters, these dissolve in 2% KOH, stable in Melzer's reagent; in older cultures (> 3 weeks) cystidia develop, these clavate to slightly moniliform, with globular to granular content; terminal or intercalary cells also form (chlamydospores) of Davidson et al., 1942), 9-15 x 7-9 µm, thick-walled, hyaline, septate at one or both ends, lacking clamps on these septa; submerged hyphae (Fig. 10) 2-3 (-4.5) µm diam, thin-walled, hyaline, smooth, much branched into finger-like terminal cells, clamped at all septa.

## DISCUSSION

Macroscopically, *H. erinaceum* subsp. *erinaceo-abietis* would not be confused with either of the species with which it is interfertile. *Hericium erinaceum* has large ovoid basidiocarps with densely crowded pendent teeth up to 3 cm long and *H. abietis* basidiocarps are loosely organized systems of branches with less crowded pendent teeth. *Hericium erinaceum* subsp. *erinaceo-abietis*, on the other hand, is an irregularly shaped, solid, nodulose mass with small teeth (up to 3 mm long) covering the entire surface and protruding in all directions.

Although similar in micromorphology to both *H. abietis* and *H. erinaceum*, *H. erinaceum* subsp. *erinaceo-abietis* can be differentiated. The basidiospores of *H. abietis* are 5-6 x 4-5 µm while those of *H. erinaceum* subsp. *erinaceo-abietis* are 6-7.5 x 4.5-6 µm. The two also differ in structure of tooth trama. *Hericium erinaceum* subsp. *erinaceo-abietis* lacks the broad (up to 15 μm diam) thick-walled hyphae (walls up to 5 μm thick) which are found in *H. erinaceum* and the inflated cells (up to 15 μm diam) that have little wall thickening.

In culture, *H. erinaceum* subsp. *erinaceo-abietis* grows about half as fast as *H. erinaceum* on malt extract agar at 25 C and about twice as fast at 32 C. The new subspecies and *H. abietis* grow equally well at 25 C on malt extract agar but *H. abietis* does not grow at 32 C while the new subspecies does.

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# TAXONOMY OF PHANEROCHAETE CHRYSORHIZON AND HYDNUM OMNIVORUM

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During type studies leading toward a monograph of *Phanerochaete* Karst., the type specimen of *Hydnum chrysorhizon* Torrey in Eaton (1822, p. 309) [≡ *Phanerochaete chrysorhizon* (Torr. in Eaton) Budington et. Gilbn.] and the type specimens of its facultative (taxonomic) synonyms were studied. Among these synonyms was the name *Hydnum omnivorum* Shear (1925). This name was applied to a species that Shear felt was probably the perfect state of *Phymatotrichum omnivorum* (Shear) Duggar (1916) [≡ *Phymatotrichopsis omnivorum* (Shear) Hennebert (1973, p. 199)]. These two species are probably not, as Shear supposed, different states of the same organism but to date this has not been demonstrated unequivocally.

When he published the name *Hydnum omnivorum*, Shear indicated (1925, p. 477) the "type" to be his number 5267, on *Maclura aurantiaca* [≡ *Maclura pomifera* (Ref.) Schmeid.], near Paris, Texas, September 1903, and provided a painting

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of the specimen. In BPI[2/] a specimen with the same collection data was found (cited by Gilbertson 1964, p. 22). Further indication that it is the same specimen referred to by Shear is the fact that it matches exactly the painting accompanying the description provided by Shear. The twigs and thorns of the twigs branch at the same angle and are located in the same place relative to each other as theyare in the painting. There is no doubt that this is the type specimen for *H. omnivorum* Shear.

The use of the name *Hydnum omnivorum* has been challenged recently by Hennebert (1973, p. 199), who states that the name refers to a Basidiomycete but is based on a type specimen that is a member of the Fungi Imperfecti. His studies of the type specimen apparently revealed neither basidia nor basidiospores, and he, therefore, considers the name illegitimate.

However, our studies of the type specimen revealed the presence of a basidiomycetous hymenium with cystidia, holobasidia, and basidiospores. Shear reported seeing none of these structures but was not in doubt as to thespecimen's being a Basidiomycete, as indicated by his text and the name he provided for it.

The epithet *omnivorum*, although probably an unfortunate choice since it is probably not the perfect state of *P. omnivorum*, fulfills the requirements for both legitimate and valid publication.

The recent use of the epithet *chrysorhizon* also deserves discussion. Gilbertson (1964, p. 23) treated *H. omnivorum* as a synonym of *H. chrysorhizon.* The two were also considered conspecific by Gilbertson, et al. (1974, 1976), Lindsey and Gilbertson (1975), and Burdsall (1976). In all four publications the name *Phanerochaete chrysorhizon* was used to encompass both species. More recent studies, however, indicate that *H. omnivorum* is a distinct species, differing from *H. chrysorhizon* in basidiocarp color, basidiospore size, cystidium characters, and distribution.

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[2/] Herbarium abbreviations are those of Holmgren and Keuken (1974).

Parmasto (1967, p. 384) proposed the genus *Hydnophlebia* Parm. for *H. chrysorhizon.* If this genus is recognized, then *Hydnum omnivorum* should be included. However, we do not feel that the hydnaceous basidiocarp, which is the only character by which these species differ from members of *Phanerochaete*, warrants this segregation. We recognize both as members of the genus *Phanerochaete*.

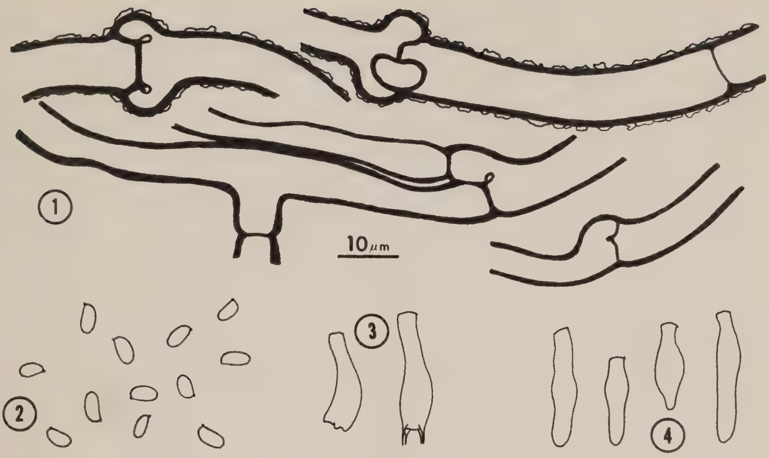
A description of the basidiocarp characters and culture characters of each species is offered. The specimens marked with an * are those from which cultures were studied. All specimens and cultures cited are on deposit at CFMR unless otherwise indicated.

*Phanerochaete chrysorhizon* (Torr. in Eaton) Budington et Gilbn. Southwest Nat. 17:417. 1973. Figs. 1-9.
≡ *Hydnum chrysorhizon* Torr. in Eaton. Manual Bot., Ed. 3, p. 309, 1822.
≡ *Oxydontia chrysorhiza* (Torr. in Eaton) Rogers et G. W. Martin. Mycologia 50:308. 1958.
≡ *Mycoacia chrysorhiza* (Torr. in Eaton) Aoshima et Furukawa. Trans. Mycol. Soc. Japan. 7:135. 1966.
≡ *Hydnophlebia chrysorhiza* (Torr. in Eaton) Parm. Eest. Nsv. Tead. Akad. Toim. 16:384. 1967.

Basidiocarp broadly effused, extending up to 20 x 10 cm, thin, membraneous, easily separable, reddish orange (7A8)[3] to deep orange (near 5A8), hydnaceous, teeth widely spaced to dense, up to 1.5 mm long, cylindrical or tapered to rounded apex, orange white (5A2) to pale orange (5A3); margin fimbriate to rhizomorphic, up to 1 mm diam, reddish orange (near 7A8).

Hyphal system monomitic; subiculum not differentiated from abhymenial surface, 250-500 µm thick (excluding teeth), a textura intricata to textura porrecta; hyphae (Fig. 1) 4-7 (-9) µm diam, hyaline to pale yellow, thick-walled (walls up to 2 µm thick) or with only slight thickening, usually densely encrusted with hyaline crystals, septa widely spaced, lacking clamps at most septa, some septa clamped, rarely with several clamps at one septum,

[3] Color notations are those of Kornerup and Wanscher (1967). The notation indicates plate number, vertical column, and horizontal columns, respectively.



Figs. 1-4.--*P. chrysorhizon* (type). Line drawings of microscopic structures from basidiocarps. 1. subicular hyphae. 2. basidiospores. 3. basidia. 4. cystidia.

branching frequent, mostly at nearly right angles; tooth trama a compact textura porrecta oriented perpendicular to substrate, hyphae like those of subiculum; subhymenium a compact textura porrecta, short-celled, hyaline, thin-walled, lacking clamps, smooth, or lightly coated with pale yellow granules; cystidia (Fig. 4) ventricose, smooth, thin-walled, hyaline, 18-40 x 4.5-6 µm, lacking clamps at basal septa; basidia (Fig. 3) clavate to broadly clavate, 15-20 x 4.5-6 µm, hyaline, thin-walled, lacking clamps at basal septa, 4-sterigmate, sterigmata 3-3.5 µm long; basidiospores (Fig. 2) 4-5 x 2-2.5 µm, ovoid to narrowly ovoid, slightly flattened adaxially, hyaline, thin-walled, smooth, negative in Melzer's reagent, acyanophilous.

Specimens Examined: FLORIDA--HHB 4720, HHB 4733, and HHB 6372, on *Quercus* sp. (oak), behind Mall, State Route 441; HHB 6452, on oak, University of Florida Horticulture Unit; HHB 6468, on *Liquidambar styraciflua* L. (sweetgum); and HHB 6478*, on *Carpinus caroliniana* Walt. (American hornbeam), Hogtown Creek Basin, NW 8th Street; all from Gainesville, Alachua County; HHB 7202, on *Nectandra coriacea* (Sw.) Griseb. (Jamaica nectandra), Gumbo Limbo Trail, Everglades National Park, Dade County. MARYLAND--

HHB 622*, on oak, Patuxent Wildlife Research Refuge, Laurel, Prince Georges County. MISSISSIPPI--HHB 8870*, on oak, and HHB 8871*, on *Pinus taeda* L. (loblolly pine), both 5 miles W of Wiggins, S of Red Creek, Stone County; HHB 8917, on *Cornus florida* L. (flowering dogwood), Hammock, Harrison Experimental Forest, Harrison County. NEW YORK--RLG 5507*, on *Populus grandidentata* Michx. (bigtooth aspen), Otisco Rd., Otisco, Onondaga County. NORTH CAROLINA--HHB 2652, on *Fraxinus* sp. (ash), Scaly School-Dryman Chapel Rd., Nantahala National Forest, Macon County; HHB 4352, on flowering dogwood, along Kephart Prong, Great Smoky Mountains National Park, Swain County. SOUTH CAROLINA--Curtis 2608, on oak, April 1849, Society Hill, Darlington County, isotype of *Hydnum fragillissimum* Berk. et Curt., (FH). TENNESSEE--HHB 3012*, on *Juglans* sp. (walnut), near Cable Mill, Cades Cove, Blount County, and HHB 4134, on *Acer* sp. (maple), Snake Den Trail, Cocke County, both from Great Smoky Mountains National Park. WISCONSIN--HHB 9375, on *Populus tremuloides* Michx. (quaking aspen), Blue Mounds State Park, Iowa County.

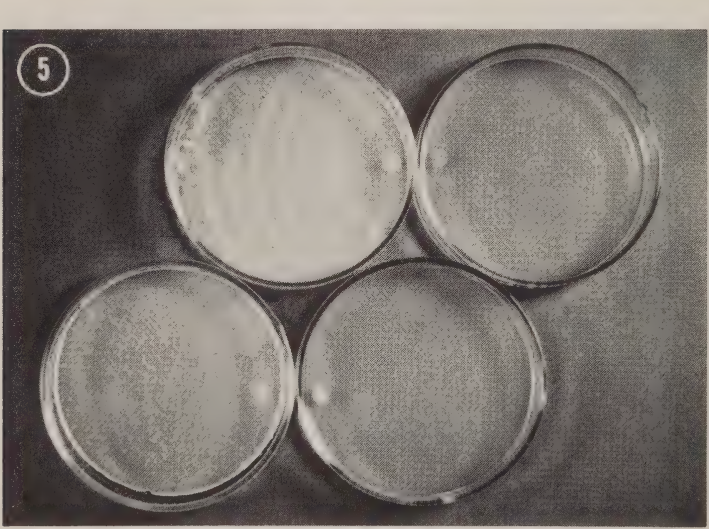


Fig. 5.--Cultures of *P. chrysorhizon* (on right showing no growth) and *H. omnivorum* (on left) grown at 36 C on malt extract agar for 14 days.

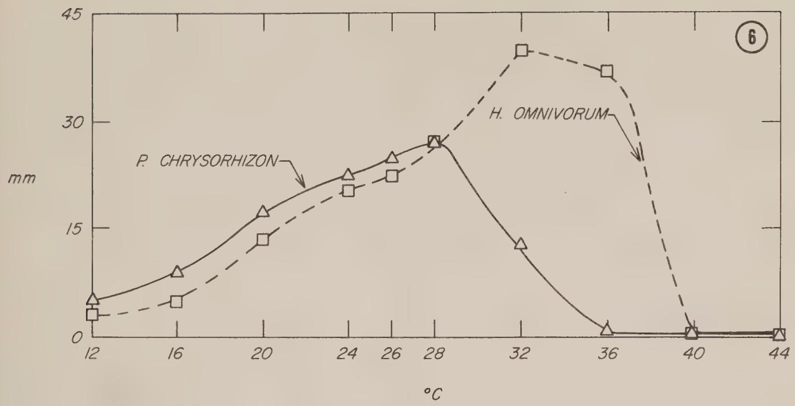


Fig. 6.--Graph showing growth of *P. chrysorhizon* and *H. omnivorum* at 10 constant temperatures on malt extract agar after 7 days.

Culture description

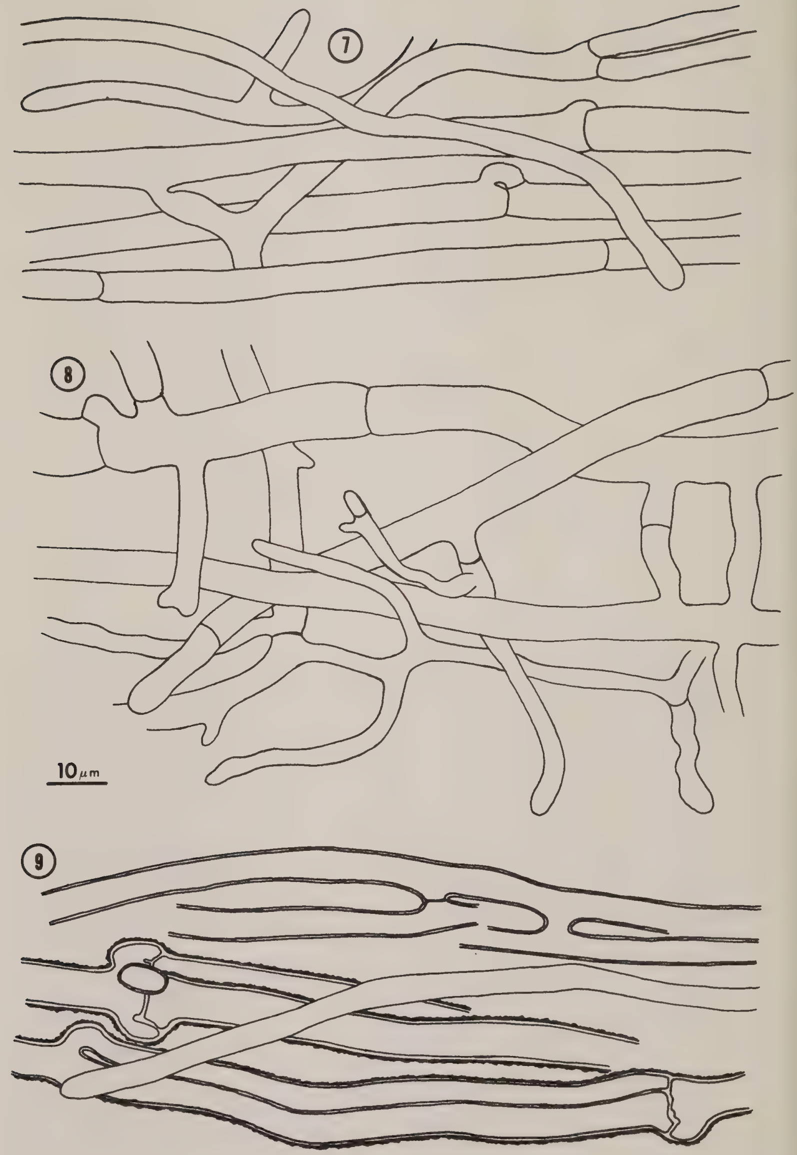
Species Code: 2.5.16.32.37.40.42.-43.54.55 (using Nobles (1965) system).

Key Pattern: B-P-I-1-10-14 (using Davidson et al. (1942) system).

Growth on 1.5% malt extract agar at 25 C moderate, 25-35 mm radius/wk, optimum growth at 28 C, trace of growth at 36 C (Figs. 5, 6); mat thin, appressed, white, becoming slightly orange, some isolates eventually with zones of orange wooly aerial hyphae, hyphae near inoculum orange; margin indistinct, even; reverse bleached; odor mild; not fruiting in 6 wk.

On gallic acid agar after 1 wk at 25 C diffusion zone up to 35 mm diam, light reaction, trace of growth; on tannic acid agar diffusion zone up to 20 mm diam, light reaction, no growth.

Marginal hyphae (Fig. 7) 2.5-7 µm diam, hyaline, thin-walled, with occasional branching, especially on narrower hyphae, mostly simple septate, with rare single or multiple clamps; aerial hyphae (Fig. 9) (2.5-) 4-7 µm diam, hyaline to pale yellow, with slightly thickened to thick walls, often aggregated to form orange cordons, usually covered

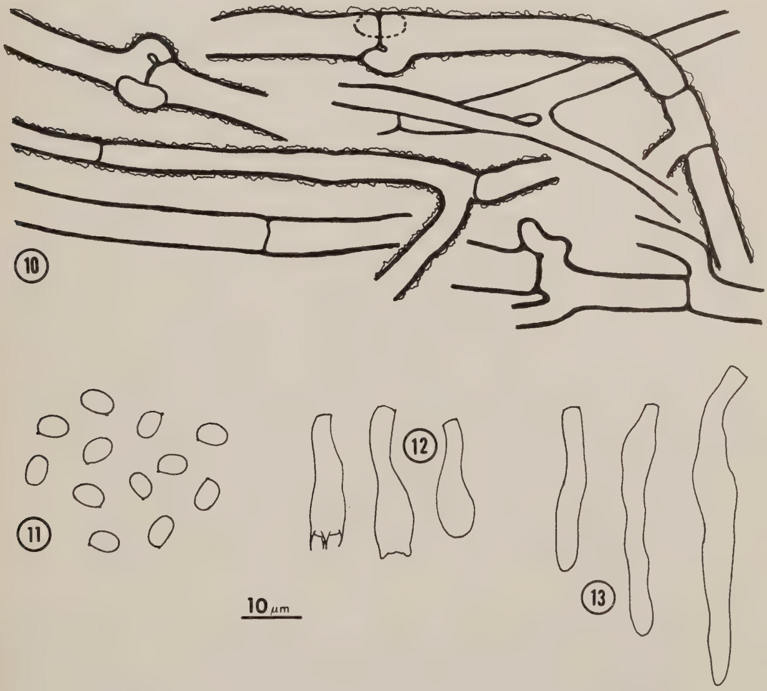


Figs. 7-9.--*P. chrysorhizon* (HHB 8871). Line drawings of microscopic structures from culture. 7. hyphae of margin. 8. submerged hyphae. 9. aerial hyphae.

with yellow granules, mostly simple septate with rare single or multiple clamps; submerged hyphae (Fig. 8) 5-7 μm diam, hyaline, thin-walled, with rare clamps, broad hyphae with infrequent branching usually producing narrow much branched hyphae.

*Phanerochaete omnivorum* (Shear) *comb. nov.*
Figs. 5, 6, 10-16.
≡ *Hydnum omnivorum* Shear, J. Agric. Res. 30:476. 1925.

Basidiocarps effused in small often poorly developed patches, thin, membraneous, creamy yellow, adnate to somewhat separable, hydnaceous; teeth up to 1 mm long, tapered to apex; subiculum white, fibrous to byssoid; margin white, thick, fibrillose and irregular in outline or rhizomorphic; rhizomorphs white, usually poorly developed, occasionally well developed and up to 0.25 mm diam.



Figs. 10-13.--*H. omnivorum* (type). Line drawings of microscopic structures from basidiocarps. 10. subicular hyphae. 11. basidiospores. 12. basidia. 13. cystidia.

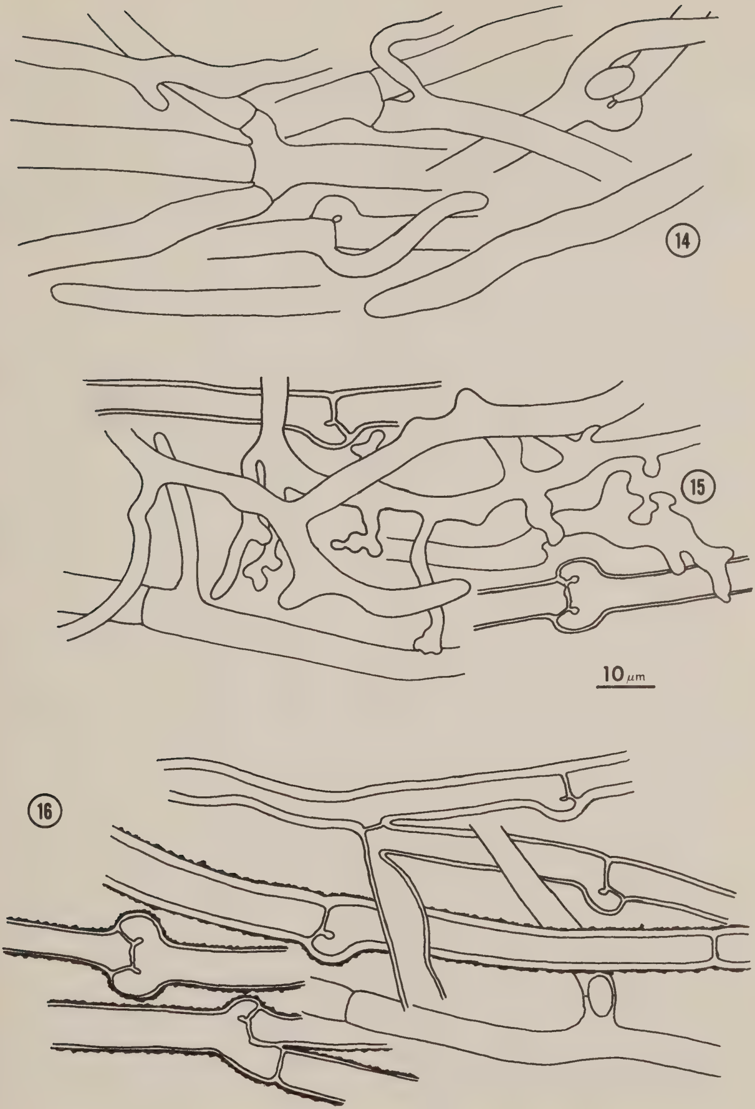
Hyphal system monomitic; subiculum a texture intricata, hyphae (Fig. 10) 5-9 (-12) µm diam, with slight wall thickening, hyaline, with clamps at some septa, sometimes multiple clamps present, with dense encrustation on some hyphae, branching at near right angles; subhymenium a compact textura porrecta, hyphae 3.5-4.5 µm diam, some areas with irregular swellings up to 6 µm becoming a textura epidermoidea, hyaline, thin-walled, much branched, smooth or with scattered hyaline granules; hymenium with cystidia and basidia; cystidia (Fig. 13) poorly developed, hyphoid, thin-walled, hyaline, of irregular length, up to 4 µm diam, protruding up to 20 µm beyond basidia; basidia (Fig. 12) (15-) 20-25 (-27) x (5.5-) 6-7 µm, clavate, hyaline, thin-walled, lacking clamps at base, 4-sterigmate, sterigmata up to 4 µm long; basidiospores (Fig. 11) 5-6 x 3-3.5 µm, nearly ovoid, slightly flattened adaxially, hyaline, thin-walled, smooth, negative in Melzer's reagent, acyanophilous.

Specimens Examined: ARIZONA--HHB 6218 and HHB 6227, on *Platanus wrightii* S. Wats. (Arizona sycamore), and HHB 6228*, on *Acacia* sp. (acacia), all from Peloncillo Mts., Cochise County; KKN 187 on *Fouquieria splendens* Engelm. (ocotillo), highway 90, milepost 299, Cochise County (ARIZ). HHB 5969*, on Arizona sycamore, and HHB 5972, on *Chilopsis linearis* (Cav.) Sweet (desert willow), Redington, Pima County; HHB 8426, on *Baccharis* sp. (desert broom), Tucson, Pima County; RLG 10887 and RLG 10888, on *Prosopis juliflora* (Sw.) DC (mesquite), Santa Catalina Mts., Pima County (ARIZ); JPL 72, on *Carnegia gigantea* (Engelm.) Britt. et Rose (saguaro), Saguaro Nat. Monument--West Unit, Pima County (ARIZ); KKN 90, KKN 102, KKN 112*, and KKN 113, on ocotillo, Santa Rita Expt. Range, Pima County (ARIZ); RLG 10857, on ocotillo, Santa Catalina Mts., Pima County (ARIZ); RLG 10391, on mesquite, Galliuro Mts., Pinal County (ARIZ); RLG 10507, on mesquite, Baboquivari Mts., Santa Cruz County (ARIZ).

Culture description

Species Code: 2.5.16.20.24.32.37.40.42.-43.54.
Key Pattern: B-P-M-1-9-11-14-16.

Growth on 1.5% malt extract agar at 25 C moderate, 25-35 mm radius/wk, optimum growth at 32 C, rapid growth at 36 C (Figs. 5, 6); mat thin, wispy downy to woolly cottony, white, becoming yellow orange near inoculum, eventually



Figs. 14-16.--*H. omnivorum* (HHB 6228). Line drawings of microscopic structures from culture. 14. hyphae of margin. 15. submerged hyphae. 16. aerial hyphae.

spreading over plate and developing cordons; margin appressed, even; reverse bleached; odor mild; not fruiting in 6 wk.

On gallic acid agar after 1 wk at 25 C diffusion zone 15-20 mm diam, very light reaction, no growth; on tannic acid agar diffusion zone 35-40 mm, very light reaction, no growth.

Marginal hyphae (Fig. 14) 3.5-7 μm diam, hyaline, thin-walled, frequently branched, mostly simple septate with rare single or multiple clamps; aerial hyphae (Fig.16) 4-7 μm diam, hyaline to pale yellow, thin- to thick-walled, often aggregated to form cordons, usually encrusted with yellow granules, simple septate with rare single or multiple clamps; submerged hyphae (Fig. 15) of two types: (a) similar to aerial hyphae but lacking encrustations; (b) 1.5-5 μm diam, hyaline, thin-walled, septa rare, clamps lacking, irregularly branched and contorted, nonstaining in KOH-phloxine mounts.

Remarks: Macroscopically *P. chrysorhizon* and *P. omnivorum* are distinguished on the basis of basidiocarp color and rhizomorph development. *Phanerochaete chrysorhizon* is bright orange with well developed orange rhizomorphs and somewhat paler spines; *P. omnivorum* is yellow or cream (including spines) with a white fimbriate to slightly rhizomorphic margin.

Microscopically *P. omnivorum* can be separated from *P. chrysorhizon* because of its broader spores, usually fewer cystidia, and a tendency toward thinner-walled hyphae (walls usually 1 μm thick while those of *P. chrysorhizon* are often 2-3 μm thick).

In culture the two species can be separated readily when grown at 36 C (Figs. 5, 6). *Phanerochaete chrysorhizon* grows only 1-2 mm in 2 wk while *P. omnivorum* nearly covers the plate in that time. At 25 C the two are not readily distinguishable.

Ecologically these species occupy vastly different niches. *Phanerochaete omnivorum* occurs on desert hardwood shrubs and trees, while *P. chrysorhizon* inhabits hardwoods (rarely conifers) in more moist areas. The specimens examined indicate that *P. omnivorum* occurs in the southwestern United States and east into Texas while *P. chrysorhizon* occurs throughout the eastern United States and west into Mississippi. An overlapping distribution in Texas is to be expected because there the dry and moist regions meet.

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# A STUDY OF *AMANITA* TYPES
## I. TAXA DESCRIBED BY C. H. PECK

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The immense influence that C. H. Peck exerted on American mycology is a well accepted and documented fact (Lloyd, 1912; Bessey, 1914; Atkinson, 1918; Burnham, 1919). Throughout his 48 year tenure with the State Museum of New York at Albany his untiring observation and analysis of the flora of New York resulted in a herbarium of many thousands of specimens, over 2700 of which were fungi (Gilbertson, 1962). Included among these were 36 taxa of the genus *Amanita* described as new.

During the period from 1867 to 1915 when Peck published his mycological studies many nomenclatural rules that are observed today were not in existence or were little used. Such was the case of the recognition of nomenclatural types. Rules governing the designation of nomenclatural types were not adopted by American mycologists until 1904 and international acceptance was not gained until 1930.

Even though Peck published new taxa after the adoption of the American Code in 1904, he still did not designate type specimens. Usually, however, he would cite one or more specimens. According to the International Code of Botanical Nomenclature (Art. 7, note 3; Guide for the Determination of Types), if more than one specimen is cited in the original description and one of these, i.e., preferably a collection by the author, can be adequately associated with an extant herbarium specimen it should be designated as a lectotype. This procedure has been followed with several of Peck's taxa.

It was not uncommon for Peck to cite only one specimen in the original description. The information contained in this citation frequently did not completely match that of any herbarium specimen. Ordinarily this might necessitate the designation of a neotype (Art. 7, note 3, International Code of Botanical Nomenclature). It has recently been noted that Peck rarely accessioned into the herbarium more than one collection of a particular organism from the same location. Any subsequent collections of this organism from that same location were usually made by someone else (Personal communication, Dr. John H. Haines, State Museum of New York). After examining many of the specimens from Peck's herbarium this practice appears to have been the case. The incongruence between the original citation and the information with the herbarium specimen appears, therefore, to be of little consequence, thus, allowing the specimen in question to be implicitly designated as the holotype. There will be no discussion for those taxa with an implicit holotype.

It is the purpose of this publication to designate and describe the type specimens for the taxa of the genus *Amanita* named by C. H. Peck. Of these 36 taxa, descriptions are provided for 30. At present five of the remaining taxa do not have representative specimens in the State Herbarium, a fifth specimen was determined not to be an *Amanita*, and *Amanita frostiana* is a nomenclatural synonym of *Agaricus muscarius* var. *minor*.

The descriptions contain macroscopic characters obtained from observations of the dried type specimens, with one exception being the color citations from the original description (in italics). Extensive microscopic observations are included when adequate reinflation of pertinent tissues permitted analysis. These studies were made on a Wild M20 bright-field, phase contrast microscope with a Nikon EFM camera attachment allowing magnifications up to 3250x. Tissues were prepared for study using techniques similar to those described by Bas (1969).

Descriptions for several types have been previously published (Jenkins, 1977), but are included here to provide a single source of reference.

## TYPES STUDIED

1. *Amanita abrupta* Peck. 1897. Torr. Bot. Club Bull. 24: 138. Holotype (Implicit: *des. mihi*): Alabama, vii. 1896, L. M. Underwood s.n.(NYS).

PILEUS: approximately 7 cm broad, plano-convex, margin slightly inrolled, faintly striate, *white*; volval remnants sparse, randomly distributed, irregular to pyramidal warts. LAMELLAE: crowded, free or just reaching stem, *white*. STIPE: 9 x 0.7 cm, tapering upward, solid, basal bulb abrupt, subglobose, *white*; annulus superior, submembranous; volval remnants as a few, irregular warts at base of stipe.

PILEIPELLIS: filamentous hyphae densely interwoven to subradial, slightly gelatinized. PILEUS TRAMA: undifferentiated filamentous hyphae and elongate, inflated cells. LAMELLA TRAMA: bilateral. SUBHYMENIUM: hyphae subcellular to cellular, clamped. BASIDIA: up to 52 x 4-10 μm, 4-sterigmate, clamped. VOLVA: filamentous hyphae on pileus extremely sparse, moderately branched, up to 8 μm diam; inflated cells predominant type, mostly globose, subglobose, and broadly elliptic, up to 37.6 x 31.3 μm, with fewer oblong-elliptic to clavate, up to 59.5 x 18.8 μm, terminal or short, terminal chains; volval material at base of stipe very similar to that above. STIPE TRAMA: filamentous hyphae sparsely branched, up to 9 μm diam, occasionally clamped; inflated cells terminal, clavate, longitudinally oriented, up to 160 x 20 μm. PARTIAL VEIL: filamentous hyphae sparsely branched, up to 7 μm diam, rarely clamped; inflated cells terminal, mostly clavate, up to 78 x 15.7 μm, with a few subglobose to pyriform, up to 21.9 x 15.6 μm.

SPORES: 7.8-9.4 x 5.5-7.0 μm ($\underline{E}$ = 1.24-1.71; $\underline{E}^{m}$ = 1.46), broadly elliptic to elongate, often adaxially flattened, hyaline, amyloid, thin walled; contents guttulate, apiculus sublateral, cylindric to truncate-conic.

2. *Amanita bivolvata* Peck. 1909. Torr. Bot. Club Bull. 36: 329.
Holotype (Implicit: *des. mihi*): Claremont, California, i. 1909, C. F. Baker s.n.(NYS).

PILEUS: 7-10 cm broad, plano-convex, margin shallowly striate, *white with brownish stains toward center*. LAMELLAE: free, crowded, *white*; lamellulae numerous. STIPE: 13-15 x 1.6-2.5 cm, equal, flocculose, *white*, basal bulb ovoid; annulus superior, narrow, *white*, soon disappearing; volva 3-5 x 4.6 cm, lobed, with an inner margin surrounding the stipe, *white*.

PILEIPELLIS: filamentous hyphae densely interwoven, gelatinized. PILEUS TRAMA: undifferentiated, filamentous hyphae, moderately branched, up to 8 µm diam, and elongate, inflated cells, terminal and short, terminal chains. LAMELLA TRAMA: bilateral; filamentous hyphae up to 8 µm diam, moderately branched, no clamps; inflated cells elongate, terminal or short, terminal chains. SUBHYMENIUM: hyphae distinctly ramose, no clamps. BASIDIA: up to 55 x 4-11.7 µm, 4-sterigmate, thin walled, no clamps. VOLVA: filamentous hyphae at base of stipe predominant, sparsely to moderately branched, up to 14 µm diam, no clamps; inflated cells few, elongate, clavate to fusiform, up to 156.5 x 37 µm, terminal. STIPE TRAMA: filamentous hyphae undifferentiated and inconspicuous; inflated cells terminal or rarely short, terminal chains, oblong-elliptic to clavate, longitudinally oriented, up to 188 x 46.9 µm. PARTIAL VEIL: filamentous hyphae up to 7 µm diam, moderately branched, no clamps observed, few gloeoplerous segments; no inflated cells.

SPORES: 8.6-10.2 x 7.0-7.8 µm ($\underline{E}$ = 1.10-1.34; $\underline{E}^m$ = 1.25), subglobose to broadly elliptic, often adaxially flattened, hyaline, amyloid, thin walled; contents guttulate; apiculus sublateral, cylindric.

3. *Amanita calyptrata* var. *albescens* Peck. 1900. Rep. N. Y. St. Mus. 53: 840, pl. A, fig. 1-5.
Holotype (Implicit: *des. mihi*): Gansevoort, vii., C. H. Peck s.n. (NYS).

PILEUS: approximately 6 cm broad, plane to plano-convex, margin distinctly striate, *whitish*; volval remnant as a large, membranous patch, *white*, covering a major portion of the pileus. LAMELLAE: free, crowded, edges even. STIPE: approximately 12 x 1.3 cm, tapering slightly upward, hollow, lumen large, no basal bulb; only a few remnants of a membranous annulus remaining; volva large, thick, membranous, lobed, usually not adhering to stipe.

PILEIPELLIS: densely interwoven, gelatinized, filamentous hyphae. PILEUS TRAMA: undifferentiated, filamentous hyphae, up to 8 µm diam, moderately branched, and elongate, inflated cells. LAMELLA TRAMA: bilateral; filamentous hyphae up to 7 µm diam, moderately branched, rarely clamped; inflated cells elongate, terminal or in short, terminal chains. SUBHYMENIUM: hyphae ramose, no clamps observed. BASIDIA: up to 50 x 4-11 µm, 4-sterigmate, thin walled, no clamps. VOLVA: outer layer composed primarily of filamentous hyphae, moderately branched, up to 8 µm diam, no clamps; inflated cells mostly subglobose to elliptic, up to 80 x 62.6 µm, terminal or occasional short, terminal chains; inner layer very similar, but with a larger number of inflated cells: volva on pileus very similar to that on base of stipe. STIPE TRAMA: filamentous hyphae fairly conspicuous, sparsely branched; inflated cells terminal, clavate, longitudinally oriented, up to 278 x 37.6 µm. PARTIAL VEIL: almost exclusively filamentous hyphae, sparsely branched, up to 7 µm diam, rarely clamped, only an occasional, small, inflated cell, usually elliptic.

SPORES: 12.5-13 x 9.0-10 µm ($\underline{E}$ = 1.30-1.38; $\underline{E}^{m}$ = 1.31), elliptic, often adaxially flattened, hyaline, nonamyloid, thin walled; contents guttulate; apiculus sublateral, cylindric.

4. *Amanita calyptratoides* Peck. 1909. Torr. Bot. Club Bull. 36: 329. Lectotype (*des. mihi*): Claremont, California, i. 1909, C. F. Baker s.n.(NYS).

PILEUS: 4-8 cm broad, convex to plano-convex, margin shallowly striate, *lead colored, darker toward center*; volval remnant as a large, irregular but unbroken, *white*, membranous patch covering a large portion of the pileus. LAMELLAE: deeply sinuate, *white*, crowded. STIPE: *white*, minutely pulverulent striate, 8-12 x 0.8-1.75 cm, tapering upward, hollow, annulus evanescent, adhering to lamellae in young specimens; volva up to 2 cm deep, irregularly lobed, *white*, frequently adhering to the stipe.

PILEIPELLIS: densely interwoven, gelatinized, filamentous hyphae. PILEUS TRAMA: undifferentiated, filamentous hyphae and elongate, inflated cells. LAMELLA TRAMA: bilateral; filamentous hyphae up to 7 µm diam, moderately branched, no clamps; inflated cells elongate, terminal or short, terminal chains. SUBHYMENIUM: hyphae ramose, no clamps. BASIDIA: up to 77 x 3.9-11.7 µm, 4-sterigmate, thin walled, no clamps. VOLVA: filamentous hyphae dominant, moderately branched, irregularly interwoven, up to 8 µm diam, no clamps; inflated cells few, mostly broadly elliptic to elliptic, up to 87.6 x 78.3 µm: tissue at base of stipe very similar to that on pileus. STIPE TRAMA: filamentous hyphae undifferentiated and inconspicuous, no clamps; inflated cells terminal, clavate to oblong-elliptic, longitudinally oriented, up to 359.4 x 68.9 µm.

SPORES: 11.7-14.8 x (6.2)7.0-8.6 µm ($\underline{E}$ = 1.50-2.27; $\underline{E}^{m}$ = 1.66), elliptic to cylindric, often adaxially flattened, hyaline, nonamyloid, thin walled; contents guttulate; apiculus sublateral, cylindric to truncate-conic.

*Typification*. Although there is apparently only one collection cited in the original description, an implicit holotype cannot be designated. In the herbarium box labeled "type" from Peck's herbarium there were two separate collections from C. F. Baker, numbers 5100 and 5115. Both were collected under Oak trees in Claremont, CA, the citation in the original publication. Examination of the specimens shows them to be the same organism. It would appear that Peck had two separate collections at his disposal when delimiting this taxon. Since this possibility exists neither can be considered the holotype. Instead a lectotype must be chosen from these two collections (Art. 7, note 3, International Code of Botanical Nomenclature). Analysis of the descriptions accompanying these specimens reveals much similarity in wording between the description of collection 5115 and that used by Peck in the original description. Based upon this similarity and the presence of four fruit bodies in 5115 vs. one fruit body in 5110, I have chosen collection 5115 as the lectotype.

5. *Amanita candida* Peck. 1897. Torr. Bot. Club Bull. 24: 137-138.
Holotype (Implicit: *des. mihi*): Alabama, x., F. S. Earle s.n.(NYS).

PILEUS: approximately 10.4 cm broad, plane, margin not striate, *white*; volval remnants as a thin pulverulence with a few, randomly scattered warts near the center. LAMELLAE: just reaching stipe, moderately broad, crowded; lamellulae attenuate. STIPE: approximately 12 x 1.5 cm, cylindrical or tapering slightly upward, solid, covered with a slight flocculence, basal bulb abruptly enlarged, subglobose to broadly elliptic, up to 4.5 x 4 cm; no annular remnants; volva as a dense flocculence or rings of small, irregular chunks.

PILEUS TRAMA: undifferentiated, filamentous hyphae, up to 8 μm diam, moderately branched and elongate, inflated cells. LAMELLA TRAMA: bilateral; filamentous hyphae up to 9 μm diam, moderately branched, no clamps observed; inflated cells elongate, terminal. SUBHYMENIUM: hyphae inflated ramose, no clamps observed. BASIDIA: up to 46 x 3-12.3 μm, 4-sterigmate, thin walled, no clamps observed. VOLVA: filamentous hyphae on pileus relatively inconspicuous, moderately branched, up to 8 μm diam, no clamps observed, inflated cells dominant, globose, broadly elliptic to broadly clavate and oblong-elliptic, 30-60 x 15-33 μm, usually as short, terminal chains: remnants on base of stipe very similar to that on pileus. STIPE TRAMA: filamentous hyphae rather abundant, up to 9 μm diam, sparsely branched; inflated cells terminal, clavate, longitudinally oriented, up to 245 x 29 μm.

SPORES: 11-12.5 x 5.9-7.0 μm ($\underline{E}$ = 1.56-2.0; $\underline{E^m}$ = 1.80), elliptic to elongate, often adaxially flattened, hyaline, amyloid, thin walled; contents guttulate; apiculus sublateral, cylindric.

6. *Agaricus chlorinosmus* Peck in Austin. 1878. Torr. Bot. Club Bull. 6: 278.
≡ *Amanita chlorinosma* (Peck) Lloyd. 1898. Volvae: 7, 15.
Holotype (Implicit: *des. mihi*): New York - Closter, viii. 1877, C. F. Austin s.n.(NYS).

PILEUS: up to 15 cm broad, plano-convex, margin slightly inrolled, not striate, *white*; volval remnants as randomly distributed, irregular warts and pulverulence, more dense on disc, *with a scarcely discernible yellow tint*. LAMELLAE: crowded, just reaching stem. STIPE: up to 13 x 2 cm, cylindrical, solid, basal bulb clavate; no annular material remaining; volval remnants as an occasional, randomly distributed wart.

PILEIPELLIS: a thin layer of densely interwoven, filamentous hyphae, gelatinous nearer the surface. PILEUS TRAMA: undifferentiated, filamentous hyphae and elongate, inflated cells. LAMELLA TRAMA: bilateral; filamentous hyphae up to 9 µm diam, moderately branched, clamped; inflated cells elongate, terminal or short, terminal chains. SUBHYMENIUM: hyphae inflated ramose to subcellular, clamped. BASIDIA: up to 57 x 3.9-9.4 µm, 4-sterigmate, thin walled, clamped. VOLVA: filamentous hyphae on pileus moderately branched, up to 8 µm diam, occasionally clamped; inflated cells mostly subglobose to broadly elliptic, up to 50 x 40 µm, with fewer oblong-elliptic to clavate, up to 45 x 10 µm, terminal or short, terminal chains: volval remnants at base of stipe very similar to that above. STIPE TRAMA: filamentous hyphae quite conspicuous, sparsely branched, up to 8 µm diam, rarely clamped; inflated cells terminal, elongate, longitudinally oriented, up to 200 x 25 µm.

SPORES: 8.2-9.4 x 5.4-5.9 µm ($\underline{E}$ = 1.49-1.71; $\overline{\underline{E}^{m}}$ = 1.61), elliptic to elongate, often adaxially flattened, hyaline, amyloid, thin walled; contents guttulate; apiculus sublateral, cylindric.

7. *Amanita crenulata* Peck. 1900. Torr. Bot. Club Bull. 27: 15. Holotype (Implicit: *des. mihi*): Massachusetts, near Boston, 1899, Mrs. E. Blackford s.n.(NYS).

PILEUS: up to 4 cm broad, becoming convex or nearly plane, thin, margin striate, *whitish or grayish, sometimes tinged with yellow*; volval remnants as thin, *whitish*, floccose patches or slight warts. LAMELLAE: crowded, with floccose-crenulate edges, reaching stipe, *white*; lamellulae truncate. STIPE: up to 4.5 x 0.4-0.8 cm, tapering upward, stuffed, *white*, basal bulb globose to subglobose; no annular material remaining; volva remaining only as floccose-mealy remnants at apex of bulb.

PILEIPELLIS: densely interwoven or subradial, gelatinized, filamentous hyphae. PILEUS TRAMA: filamentous hyphae undifferentiated and inconspicuous; inflated cells approximately up to 160 x 64 µm, clavate to irregularly elongate, terminal. LAMELLA TRAMA: bilateral; filamentous hyphae undifferentiated. SUBHYMENIUM: hyphae ramose, clamps not observed. BASIDIA: 35-42 x 4-9.4 µm, 4-sterigmate, clamps not observed. VOLVA: filamentous hyphae on pileus 2-6.5 µm diam, sparsely to moderately branched, without clamps; gloeoplerous hyphae moderately abundant; inflated cells up to 75 x 51 µm, subglobose, ovoid, broadly elliptic, elliptic, fusiform, clavate, arranged mostly as randomly oriented, terminal chains, the terminal element usually broadly elliptic to ovoid: volva remnants at base very similar to those on pileus. STIPE TRAMA: filamentous hyphae undifferentiated and inconspicuous with terminal, clavate, longitudinally oriented cells, up to 200 x 32 µm.

SPORES: 7.9-8.7 x 7.0-8.7 µm ($\underline{E}$ = 1.0-1.13; $\overline{\underline{E}^{m}}$ = 1.04), globose to subglobose, smooth, hyaline, thin walled, nonamyloid; contents guttulate; apiculus sublateral, cylindric to truncate-conic.

Typification. In the introduction an explanation was given for the designation of implicit holotypes for several of Peck's taxa.

Additional explanation is required for this taxon, however. In a previous publication (Jenkins, 1977) a lectotype was designated for *A. crenulata*. This designation was in error and should be disregarded.

As a result of specimen analysis during this study, as well as that of the previously cited publication, I have now studied all of the specimens of *A. crenulata* in the Peck herbarium. A reevaluation of the type specimen in question now requires me to accept it as an implicit holotype.

8. *Amanita elongata* Peck. 1909. Bull. N. Y. St. Mus. 131: 33.
Holotype (Implicit: *des. mihi*): Pennsylvania, vii. 1907, E. B. Sterling s.n.(NYS).

PILEUS: approximately 4.5 cm broad, plano-convex, margin striate, flesh moderately thick on disc, *yellow or orange, sometimes more deeply colored in the center*; volval remnants as randomly distributed, floccose patches. LAMELLAE: free, crowded, *white*; lamellulae attenuate. STIPE: approximately 11 x 0.4-0.8 cm, tapering upward, glabrous, slightly pruinose above annulus, stuffed, *white or whitish at the top, pallid below*, basal bulb elliptic, up to 2 x 1.3 cm; annulus superior, very thin, membranous, *pale yellow*, collapsing on stem or remaining attached to gills; volval remnants sparse, as slight rim or loose, floccose patches.

PILEIPELLIS: densely interwoven, gelatinized, filamentous hyphae. PILEUS TRAMA: undifferentiated, filamentous hyphae, moderately branched, no clamps, up to 8 µm diam; inflated cells elongate, terminal or in short, terminal chains. SUBHYMENIUM: hyphae ramose to inflated ramose, no clamps. BASIDIA: up to 40 x 4.5-9.4 µm, 4-sterigmate, thin walled, no clamps. VOLVA: filamentous hyphae on pileus moderately branched, up to 8 µm diam, no clamps; inflated cells mostly globose to elliptic, up to 93.9 x 62.6 µm, with a few elongate, up to 94 x 31.3 µm, terminal or short, terminal chains: volval material at base of stipe very similar to that on pileus, but with a larger number of filamentous hyphae. STIPE TRAMA: filamentous hyphae sparsely branched, up to 8 µm diam, no clamps; inflated cells terminal, clavate, longitudinally oriented, up to 281 x 37 µm. PARTIAL VEIL: composed primarily of filamentous hyphae, moderately branched, up to 7 µm diam, no clamps, with a few variform, terminal, inflated cells, up to 60 x 30 µm.

SPORES: 7.8-9.4 x 5.5-6.2 µm ($\underline{E}$ = 1.42-1.71; $\underline{E}^m$ = 1.51) elliptic to elongate, often adaxially flattened, hyaline, amyloid, thin walled; contents guttulate; apiculus sublateral, truncate-conic.

9. *Amanita frostiana* (Pk.) Sacc. (See *Agaricus muscarius* var. *minor*).

10. *Amanita frostiana* var. *pallidipes* Peck. 1899. Rep. N. Y. St. Mus. 53: 855.
Neotype (*des. mihi*): New York - Port Jefferson, Suffolk Co., vii., C. H. Peck s.n.(NYS); mixed collection, specimens annotated.

PILEUS: approximately 2.5-4 cm broad, convex to plane, margin faintly striate, *whitish to pale yellow*; volval remnants as floccose patches or flattened warts. LAMELLAE: free, crowded; lamellulae truncate. STIPE: approximately 3.5-6 x 0.3-0.6 cm, tapering slightly upward, *white*, basal bulb ovoid; annulus fragmentary, 1.5-2 cm from apex of stipe, *white*; volva often extending above apex of bulb as slight, free margin.

PILEIPELLIS: densely interwoven or subradial, gelatinized, filamentous hyphae. PILEUS TRAMA: composed of undifferentiated, filamentous hyphae and inflated, elongate cells. LAMELLA TRAMA: bilateral; filamentous hyphae undifferentiated; inflated cells variform. SUBHYMENIUM: hyphae ramose, clamps occasional. BASIDIA: 41-50 x 5-11.5 µm, 4-sterigmate, rarely clamped. VOLVA: filamentous hyphae on pileus up to 8 µm diam, moderately branched, rarely clamped; inflated cells up to 100 x 51 µm, ovoid, broadly elliptic, subglobose, elongate, elliptic, clavate, or fusiform, often as single, terminal cells or irregularly disposed to apico-basal chains of cells: filamentous hyphae of volva at base of stipe up to 7 µm diam, moderately branched, rarely clamped; inflated cells up to 100 x 40 µm, shapes similar to those on pileus but with a larger proportion of elongate cells. STIPE TRAMA: filamentous hyphae undifferentiated and relatively inconspicuous; inflated cells terminal, clavate, longitudinally oriented, up to 318 x 45 µm. PARTIAL VEIL: filamentous hyphae up to 7 µm diam, moderately branched, rarely clamped; inflated cells rare, elongate, terminal, not exceeding 50 x 10 µm.

SPORES: (7.3)7.9-10.2 x (5.8)6.3-7.9(8.4) µm ($\underline{E}$ = 1.13-1.46; $\underline{E}^m$ = 1.27), subglobose, elliptic, adaxially flattened, smooth, hyaline, thin walled, nonamyloid; contents guttulate; apiculus sublateral, cylindric to slightly truncate-conic.

Typification. There were no specimens originally cited, requiring designation of a neotype. The collection chosen is mixed, but includes fruit bodies exhibiting the characters of the original description. The two taxa can be separated on amyloidity of spores, those of the type fruit bodies of *Amanita frostiana* var. *pallidipes* exhibiting a negative reaction, the others reacting positively. Fruit bodies have been annotated appropriately.

11. *Amanita glabriceps* Peck. 1909. Bull. N. Y. St. Mus. 131: 18-19, pl. u., fig. 1-4.
Lectotype (*des. mihi*): New York - Coopers Plains, Steuben Co., vii., C. H. Peck s.n.(NYS).

PILEUS: approximately 7 cm broad, plano-convex to slightly depressed, thin, margin striate, *white or yellowish white, sometimes slightly brownish in the center*; no volval remnants on pileus. LAMELLAE: free, crowded, *white*; lamellulae truncate. STIPE: up to 14 x 0.9 cm, tapering upward, stuffed, floccose-squamulose, *white*, base clavate; annulus fragmentary, median; volva appressed with a slight, free ring of volval material above the free, margined collar.

PILEIPELLIS: moderately dense, interwoven to subradial gelatinized, filamentous hyphae. PILEUS TRAMA: composed primarily of clavate to irregularly elongate, inflated cells; filamentous hyphae undifferentiated with clamps. LAMELLA TRAMA: bilateral; filamentous hyphae undifferentiated; inflated cells elongate. SUBHYMENIUM: hyphae ramose, occasionally clamped. BASIDIA: 39-50 x 4.5-9.4 µm, 4-sterigmate, no clamps observed. VOLVA: filamentous hyphae at base of stipe 2-6 µm diam, moderately branched, without clamps; inflated cells subglobose, broadly elliptic, ovoid, oblong-elliptic, elliptic, clavate, up to 64 x 45 µm. STIPE TRAMA: filamentous hyphae 3-8 µm diam, sparsely branched, rarely clamped; inflated cells terminal, clavate, longitudinally oriented, up to 240 x 35 µm. PARTIAL VEIL: filamentous hyphae 3-6 µm diam, moderately branched, rarely clamped; inflated cells terminal, clavate, up to 180 x 25 µm.

SPORES: 7.9-9.4 x 6.3-7.9 µm ($\underline{E}$ = 1.19-1.38; $\underline{E}^m$ = 1.28), broadly elliptic to elliptic, adaxially flattened, smooth, hyaline, nonamyloid; contents guttulate; apiculus sublateral, cylindric to truncate-conic.

Typification. In Peck's original description only two syntypes were cited, making mandatory the selection of a lectotype. Although both specimens cited were of comparable condition, the one collected by Peck was given preference.

12. *Amanita magnivelaris* Peck. 1897. Rep. N. Y. St. Mus. 50: 96. Holotype (Implicit: *des. mihi*): Port Jefferson, Suffolk Co., vii., s.n.(NYS).

PILEUS: approximately 8 cm broad, plane to plano-convex, margin not striate, *white or yellowish-white*; volval remnants a single, membranous patch on disc. LAMELLAE: crowded, free, *white*; lamellulae numerous. STIPE: approximately 9 x 0.7-1.2 cm, tapering upward, apex slightly expanded, *white*, basal bulb elliptic, approximately 2.5 x 2 cm; annulus superior, pendant, ample, submembranous, *white*; volva at base of stipe sheathing, membranous, lobed.

PILEIPELLIS: densely interwoven, filamentous hyphae, slightly gelatinized. PILEUS TRAMA: undifferentiated, filamentous hyphae and inflated, elongate cells. LAMELLA TRAMA: bilateral. SUBHYMENIUM: hyphae ramose, no clamps observed. BASIDIA: up to 45 x 4-11.7 µm, 4-sterigmate, no clamps. VOLVA: filamentous hyphae on pileus abundant, moderately branched, up to 8 µm diam; inflated cells abundant, subglobose, broadly elliptic, elliptic, to clavate, up to 109.9 x 46.9 µm, usually terminal, with occasional terminal chains: volval material at base of stipe predominantly filamentous hyphae, up to 8 µm diam, with a small number of cells similar to those of pileus volva, in addition, an extensive gelatinous layer, representative of the pileipellis. STIPE TRAMA: filamentous hyphae sparsely branched, up to 7 µm diam, no clamps; inflated cells terminal, clavate, longitudinally oriented, up to 250.5 x 31 µm. PARTIAL VEIL: entirely filamentous hyphae, up to 8 µm diam, moderately branched, no clamps; no inflated cells.

SPORES: 8.6-10.9 x 5.5-7.8 µm ($\underline{E}$ = 1.34-1.56; $\underline{E}^m$ = 1.47), elliptic, often adaxially flattened, hyaline, amyloid, thin walled; contents guttulate, apiculus sublateral, cylindric.

13. *Amanita morrisii* Peck. 1910. Bull. N. Y. St. Mus. 139: 42.
Holotype (Implicit: *des. mihi*): Massachusetts - Natick, ix. - x. 1909, G. E. Morris s.n.(NYS).

PILEUS: approximately 9 cm broad, plano-convex, glabrous, flesh moderately thin, margin not striate, *dark grayish brown to blackish brown*; volval remnants as small, sparse, floccose patches. LAMELLAE: free, crowded, edges smooth, *white*; lamellulae attenuate. STIPE: approximately 15 x 1 cm, tapering slightly upward, apex expanded, very slightly floccose, stuffed, *sometimes grayish and striate at the top, usually white*, basal bulb subglobose to ovoid, up to 2.5 x 2 cm; annulus superior, up to 3 cm from apex, membranous, double-edged, *whitish buff beneath*; volva as occasional, small, floccose patches.

PILEIPELLIS: densely interwoven to subradial, gelatinized, filamentous hyphae. PILEUS TRAMA: undifferentiated, filamentous hyphae and elongate, inflated cells. LAMELLA TRAMA: bilateral; filamentous hyphae up to 8 µm diam, moderately branched, no clamps observed; inflated cells elongate, terminal or short terminal chains. SUBHYMENIUM: hyphae inflated ramose, no clamps observed. BASIDIA: up to 43 x 4.9-8.6 µm, 4-sterigmate, thin walled, no clamps observed. VOLVA: filamentous hyphae on pileus inconspicuous, sparsely branched, up to 8 µm diam, no clamps observed; inflated cells dominant, globose, subglobose, broadly elliptic, with a few small, elongate, up to 62.6 x 26.6 µm, terminal or short, terminal chains, the subtending cells being usually elongate. STIPE TRAMA: filamentous hyphae inconspicuous, sparsely branched, up to 7 µm diam, no clamps observed; inflated cells terminal, or occasional short, terminal chains, clavate to oblong-elliptic, longitudinally oriented, up to 187 x 31.3 µm. PARTIAL VEIL: predominantly filamentous hyphae, moderately branched, up to 7 µm diam, no clamps observed; a significant number of inflated cells, cylindrical, up to 125 x 9.5 µm, rarely exceeding that diameter.

SPORES: 7.0-7.8 x 5.5-6.3 µm ($\underline{E}$ = 1.24-1.42; $\underline{E}^m$ = 1.27), broadly elliptic to elliptic, often adaxially flattened, hyaline, amyloid, thin walled; contents guttulate; apiculus sublateral, cylindrical.

14. *Amanita multisquamosa* Peck. 1900. Rep. N. Y. St. Mus. 53: 840, pl. B, fig. 1-7.
Lectotype (*des. mihi*): New York - Amagansett, Suffolk Co., vii., C. H. Peck s.n.(NYS).

PILEUS: approximately 4 cm broad, convex to plane, margin slightly striate, *white or white with a brown or brownish center*; volval remnants as numerous, angular, erect warts, more closely spaced toward disc. LAMELLAE: free, crowded, *white*; lamellulae truncate. STIPE: approximately 5 x 0.3-0.6 cm, tapering slightly upward, stuffed, *white*, basal bulb ovoid; annulus fragmentary, approximately 2 cm from apex of stipe, *white*; volva as slight, free margin at apex of bulb, not inrolled.

PILEIPELLIS: gelatinous layer with relatively little hyphal structure remaining. PILEUS TRAMA: composed of undifferentiated, filamentous hyphae and inflated, elongate cells. LAMELLA TRAMA: bilateral. SUBHYMENIUM: hyphae ramose. BASIDIA: 40-47 x 4.5-11 µm, 4-sterigmate, no clamps observed. VOLVA: filamentous hyphae on pileus approximately 2-8 µm diam, moderately branched, occasionally clamped, with a significant number of gloeoplerous hyphae; inflated cells up to 76 x 51 µm, subglobose, broadly elliptic, ovoid, elliptic, oblong-elliptic, clavate, usually arranged in terminal, randomly oriented to apico-basal chains: filamentous hyphae of volva at base of stipe approximately 3-7 µm diam, moderately branched, with occasional clamps; inflated cells similar to those on pileus with a larger number of broadly shaped cells. STIPE TRAMA: filamentous hyphae up to 7 µm diam, moderately branched, clamped; inflated cells terminal, clavate, longitudinally oriented, up to 255 x 38 µm. PARTIAL VEIL: filamentous hyphae up to 3-7 µm diam, moderately branched, clamped; inflated cells sparse, terminal, clavate, up to 130 x 20 µm.

SPORES: 8.7-11 x 7.0 8.7 µm ($\underline{E} = 1.10$-$1.39$; $\underline{E^m} = 1.22$), subglobose to elliptic, often adaxially flattened, smooth, hyaline, nonamyloid, thin walled; contents guttulate; apiculus sublateral, truncate-conic.

Typification. Peck's original description contained no citation of specimens, but only three counties in which collections were made. The lectotype is from one of these, and has been chosen based on morphological similarities with the original description and in agreement with Bas (annotated specimen).

15. *Agaricus muscarius* var. *albus* Peck. 1880. Rep. N. Y. St. Mus. 33: 44.
≡ *Amanita muscaria* var. *alba* (Pk.) Peck. 1893. Rep. N. Y. St. Mus. 46: 53.
Neotype (*des. mihi*): New York - Albany and Delmar, x., C. H. Peck s.n.(NYS).

PILEUS: approximately 4-9 cm broad, convex to plano-convex, relatively thin, margin striate, *white*; volval remnants as thin, floccose patches or small, angular warts, arranged in nearly concentric rings. LAMELLAE: free to approximate, crowded; lamellulae truncate. STIPE: up to 8 x 0.9 cm, tapering slightly upward, stuffed to hollow, basal bulb ovoid, up to 2.5 x 2 cm; annulus fragmentary; volva as irregular, floccose ringlets at apex of bulb and lower stipe.

PILEIPELLIS: densely interwoven, gelatinized, filamentous hyphae. PILEUS TRAMA: composed of undifferentiated, filamentous hyphae, 3-9 µm diam; inflated cells elongate. LAMELLA TRAMA: bilateral; filamentous hyphae undifferentiated; inflated cells elongate. SUBHYMENIUM: hyphae ramose, occasionally clamped. BASIDIA: 41-50 x 4-11.5 µm, usually 4-sterigmate, occasionally clamped. VOLVA: filamentous hyphae on pileus up to 8 µm diam, moderately branched, clamps occasional; inflated cells globose, subglobose, broadly elliptic, ovoid, elliptic, clavate, fusiform, up to 138 x 51 µm, arranged as random to apico-basal, terminal chains: filamentous hyphae of volva at base of stipe up to 8.5 µm diam, moderately branched, occasionally clamped; inflated cells very similar to those on pileus. STIPE TRAMA: filamentous hyphae undifferentiated and relatively inconspicuous with terminal, clavate, longitudinally oriented cells, up to 225 x 25 µm.

SPORES: 9.4-11.2 x 7.0-8.4 µm ($\underline{E}$ = 1.29-1.45; $\underline{E}^m$ = 1.36), broadly elliptic to elliptic, adaxially flattened, smooth, hyaline, nonamyloid; contents guttulate; apiculus sublateral, cylindric.

Typification. Peck cited no specimens in the original description, thus requiring the designation of a neotype. The specimen above was chosen because of its proximity to Peck's primary collecting area, its acceptable condition, and the exhibition of morphological characteristics associated with the A. *muscaria* complex.

16. *Agaricus muscarius* var. *major* Peck. 1872. Rep. N. Y. St. Cab. 23: 69.
Holotype (Implicit: *des. mihi*): Catskill Mountains, x., C. H. Peck s.n.(NYS).

PILEUS: approximately 8 cm broad, plano-convex, surface glabrous, margin striate, flesh moderately thin; volval remnants as irregular to pyramidal warts, randomly disposed, frequently becoming thinner toward margin. LAMELLAE: moderately broad. STIPE: approximately 9 x 1.6 cm, tapering upward, stuffed, quite fibrillose on surface, basal bulb elliptic, up to 2.5 x 2 cm; annulus superior, floccose-membranous; no volval remnants remaining at base of stipe.

PILEIPELLIS: densely interwoven to subradial, gelatinized, filamentous hyphae. PILEUS TRAMA: undifferentiated, filamentous hyphae and elongate, inflated cells. LAMELLA TRAMA: bilateral; filamentous hyphae up to 7 µm diam, moderately branched, occasionally clamped; inflated cells elongate, terminal or in short, terminal chains. SUBHYMENIUM: hyphae ramose, occasionally clamped. BASIDIA: up to 62 x 4-11.8 µm, 4-sterigmate, walls thin, clamps not observed. VOLVA: remnants on pileus a dense to loose tissue of irregularly disposed to apico-basal, terminal chains of inflated cells and single, terminal cells; cells globose, subglobose, broadly elliptic, elliptic, oblong-elliptic, fusiform to clavate, up to 138 x 69 µm; filamentous hyphae up to 8 µm diam, abundant, moderately branched, occasionally clamped, with abundant gloeoplerous segments: remnants at base of stipe very similar to that on pileus, but with a smaller number of inflated cells. STIPE TRAMA: filamentous hyphae up to 9 µm diam, sparsely branched, clamped; inflated cells up to 376 x 45 µm, clavate to oblong-elliptic, terminal, longitudinally oriented. PARTIAL VEIL: composed primarily of moderately branched, occasionally clamped, filamentous hyphae, up to 8 µm diam, with a significant number of inflated cells, clavate, terminal, up to 74 x 18 µm.

SPORES: 8.9-10.2 x 5.9-7.6 µm ($\underline{E}$ = 1.17-1.59; $\underline{E}^m$ = 1.38), broadly elliptic to elongate, adaxially flattened, thin walled, hyaline, nonamyloid; contents guttulate to subgranular; apiculus sublateral, cylindric to truncate-conic.

17. *Agaricus muscarius* var. *minor* Peck. 1869. Rep. N. Y. St. Mus. 23: 69.
≡ *Amanita frostiana* (Pk.) Sacc. 1887. Syll. Fung. 5: 14.
Neotype (*des. mihi*): New York - Croghan, Lewis Co., no date, C. H. Peck s.n.(NYS).

PILEUS: approximately 3 cm broad, convex or expanded, margin striate, *bright orange*; volval remnants as small patches to small warts, more numerous over disc. LAMELLAE: free, crowded, *tinged with yellow*; lamellulae truncate. STIPE: approximately 5 x 0.3-0.5 cm, tapering slightly upward, stuffed, *yellow*, bulbous at base; annulus fragmentary, approximately 1.5 cm from stipe apex; volva extending above bulb as slight margin, with narrow, ascending rings of floccose material below margin of bulb.

PILEIPELLIS: densely interwoven to subradial, gelatinized, filamentous hyphae. PILEUS TRAMA: undifferentiated, filamentous hyphae with inflated cells, mostly elongate. LAMELLA TRAMA: bilateral; filamentous hyphae undifferentiated; inflated cells elongate. SUBHYMENIUM: hyphae ramose, clamps not observed. BASIDIA: 40-50 x 4.5-11 µm, 4-sterigmate, clamps rare. VOLVA: filamentous hyphae on pileus 3-7 µm diam, scarcely to moderately branched, clamped; inflated cells globose, subglobose, broadly elliptic, ovoid, up to 76 x 57 µm, with clavate, fusiform, oblong-elliptic, astringo-elliptic, up to 160 x 38 µm, arranged as irregular to apico-basal, terminal chains: filamentous hyphae of volva at base of stipe 3-9 µm diam, moderately branched, frequently clamped; inflated cells very similar to those above. STIPE TRAMA: filamentous hyphae undifferentiated and inconspicuous with terminal, oblong-elliptic to clavate, longitudinally oriented, inflated cells up to 240 x 35 µm. PARTIAL VEIL: filamentous hyphae 3-8 µm diam, moderately branched, clamped, with occasional, terminal, inflated cells up to 160 x 20 µm.

SPORES: 7.9-8.7 x 7.9-8.7 µm ($\underline{E}$ = 1.0-1.01; $\underline{E}^{m}$ = 1.01), globose to subglobose, smooth, hyaline, nonamyloid, thin walled; contents guttulate; apiculus sublateral, truncate-conic.

Typification. Peck did not cite any specimens in the original description, forcing the selection of a neotype. The collection chosen as type is mixed, containing fruit bodies of two morphologically similar taxa. When Peck changed the rank of the taxon he emended the original description by adding the character of globose spore shape. This enables division of this collection into fruit bodies with globose spores (A. *frostiana*) and those with elliptic spores (presumably A. *flavoconia*). In addition the globose spores of A. *frostiana* are nonamyloid while those of the elliptic spored specimen are amyloid.

18. *Agaricus nivalis* Peck. 1880. Rep. N. Y. St. Mus. 33: 48.
≡ *Amanita nivalis* (Pk.) Lloyd. 1898. Volvae: 9, 16.
Neotype (*des. mihi*): New York - Worcester, Otsego Co., no date, C. H. Peck s.n.(NYS).

PILEUS: approximately 4.5-5 cm broad, plane, thin, *white, sometimes tinged with yellow or ochraceous on the disk*, margin striate; no volval remnants on pileus. LAMELLAE: barely free, crowded, *white*; lamellulae truncate. STIPE: approximately 10 x 0.6 cm, tapering slightly upward, *white*, base subglobose to ovoid; annulus absent; volva delicate, floccose, at apex of bulb forming a fragile, rim-like structure or leaving fragments on lower stipe.

PILEIPELLIS: a layer of interwoven, gelatinized, filamentous hyphae. PILEUS TRAMA: filamentous hyphae relatively slender and moderately branched; inflated cells clavate to irregularly elongate, up to 130 x 32 µm. LAMELLA TRAMA: bilateral; filamentous hyphae undifferentiated; inflated cells oblong-elliptic to clavate, up to 110 x 24 µm, terminal or in very short, terminal chains. SUBHYMENIUM: hyphae ramose, rarely clamped. BASIDIA: 40-47 x 4.7-11 µm, 4-sterigmate, rarely clamped. VOLVA: filamentous hyphae at base of stipe up to 7 µm diam, sparsely branched, without clamps; inflated cells up to 125 x 25 µm, subglobose, broadly elliptic, ovoid, oblong-elliptic, clavate, usually as irregularly disposed, terminal chains. STIPE TRAMA: filamentous hyphae up to 6 µm diam, sparsely branched, without clamps; inflated cells terminal, clavate, longitudinally oriented, up to 380 x 32 µm.

SPORES: 7.0-9.4 x 6.3-7.9 µm ($\underline{E}$ = 1.11-1.38; $\underline{E^{m}}$ = 1.20), subglobose to elliptic, often adaxially flattened, smooth, hyaline, thin walled, nonamyloid; contents guttulate; apiculus sublateral, cylindric.

Typification. In the original description Peck cited no specimens, thereby forcing the selection of a neotype. He did, however, mention in his discussion three counties in which he had collected the fungus. Based on the similarity of morphological characters of these specimens to the original description, the neotype has been selected as a collection from one of these locations.

19. *Amanitopsis parcivolvata* Peck. 1900. Torr. Bot. Club Bull. 27(12): 610.
≡ *Amanita parcivolvata* (Pk.) Gilb. 1941. Iconogr. Mycol. 27(2): 226.
Lectotype (*des. mihi*): North Carolina - Skyland, Henderson Co., vii., Miss Mary L. Wilson s.n.(NYS).

PILEUS: approximately 3 cm broad, convex to plane, flesh thin, margin striate, *orange or yellow, sometimes orange in the center and yellow or whitish on the margin*; no volval remnants remaining. LAMELLAE: free, crowded, *pale yellow*; lamellulae truncate. STIPE: approximately 3 x 0.2-0.4 cm, tapering slightly upward, stuffed, *pale yellow, rarely fading to white*, base ovoid; volval remnants as sparse, very fine floccose material at top of basal bulb, *white*.

PILEIPELLIS: densely interwoven, gelatinized, filamentous hyphae. PILEUS TRAMA: undifferentiated, filamentous hyphae and elongate, inflated cells. LAMELLA TRAMA: bilateral; filamentous hyphae approximately 3-6 µm diam, moderately branched, clamped; inflated cells up to 100 x 25 µm, elongate, terminal or as short, terminal chains. SUBHYMENIUM: hyphae ramose, clamped. BASIDIA: 40-47 x 4.5-12.6 µm, 4-sterigmate, clamps not observed. VOLVA: filamentous hyphae at base of stipe very sparse, approximately 2-6 µm diam, moderately branched, rarely clamped; inflated cells up to 70 x 64 µm, globose, subglobose, ovoid, broadly elliptic, elliptic, clavate, usually arranged as terminal, randomly oriented chains. STIPE TRAMA: filamentous hyphae undifferentiated and inconspicuous; inflated cells terminal, clavate to oblong-elliptic, longitudinally oriented, 222 x 64 µm.

SPORES: 11-11.8 x 6.3-7.9 µm ($\underline{E}$ = 1.39-1.75; $\underline{E^{m}}$ = 1.52);

elliptic to elongate, often adaxially flattened, hyaline, nonamyloid, thin walled; contents guttulate; apiculus sublateral, cylindric to truncate-conic.

Typification. In the original description two syntypes were cited. Although a lectotype should ideally be a specimen collected by the author, neither of the syntypes was collected by Peck. The specimen in the best condition was, therefore, selected.

20. *Amanita peckiana* Kauff. in Peck. 1913. Mycologia 5: 67. Holotype (Implicit: *des. mihi*): Michigan - New Richmond, ix. 1912, C. H. Kauffman s.n.(NYS).

PILEUS: approximately 6 cm broad, plano-convex, margin not striate, slightly inrolled, *white*; no volval remnants remaining. LAMELLAE: free or just reaching stem, moderately crowded, *white*; lamellulae attenuate. STIPE: up to 5.5 x 0.8-1.0 cm, tapering slightly upward, base slightly enlarged; annulus remaining attached to lamellae and margin of pileus; volva thick, membranous, saccate, lobed, up to 1 cm deep.

PILEIPELLIS: a layer of interwoven, gelatinized, filamentous hyphae. PILEUS TRAMA: filamentous hyphae up to 8 µm diam; inflated cells clavate to elongate. LAMELLA TRAMA: bilateral; filamentous hyphae undifferentiated; inflated cells oblong-elliptic to elongate, terminal or in very short, terminal chains. SUBHYMENIUM: hyphae ramose to inflated ramose, not clamped. BASIDIA: 39-46 x 4-12 µm, 4-sterigmate, no clamps. VOLVA: filamentous hyphae at base of stipe abundant, up to 8 µm diam, moderately branched, no clamps; inflated cells mostly globose to broadly elliptic, up to 78 x 78 µm, with fewer elongate cells, up to 93.9 x 31.3 µm, disposed as terminal chains. STIPE TRAMA: filamentous hyphae up to 8 µm diam, sparsely branched, without clamps; inflated cells terminal, clavate, longitudinally oriented, up to 234.7 x 37 µm. PARTIAL VEIL: filamentous hyphae up to 7 µm diam, moderately branched, no clamps, with very occasional, terminal, inflated cells, up to 45 x 15 µm.

SPORES: 12.5-14.8 x 4.9-5.9 µm ($\underline{E}$ = 2.27-3.02; $\underline{E}^m$ = 2.60), cylindric, smooth, hyaline, amyloid, thin walled; contents guttulate; apiculus sublateral, cylindric.

Observation. This taxon is included with the taxa described as new by C. H. Peck only because it appeared in one of his publications. Primary credit should go to C. H. Kauffman who first collected and described the specimens. Accompanying the type specimen is a letter and a description from Kauffman to Peck. In this letter Kauffman emphasized the necessity of designating this organism as a new species. In addition, the included description is almost word for word the same as the published description. In accordance with Recommendation 46D, International Code of Botanical Nomenclature, C. H. Kauffman should be primarily associated with the publication of this name.

21. *Amanita phalloides* var. *striatula* Peck. 1902. Bull. N. Y. St. Mus. 54: 961.

Holotype (Implicit: *des. mihi*): Bolton, no date, C. H. Peck s.n.(NYS).

PILEUS: approximately 4 cm broad, plano-convex, thin margin, very faintly striate, *white*; no volval remnants remaining on pileus. LAMELLAE: just reaching stipe, crowded, edges slightly floccose; lamellulae attenuate. STIPE: approximately 7.5 x 0.6 cm, tapering upward, stuffed, basal bulb globose to subglobose; annulus superior, thin, membranous, delicate, collapsing; volva membranous, moderately thick, shallow.

PILEIPELLIS: densely interwoven, gelatinized, filmentous hyphae. PILEUS TRAMA: undifferentiated, filamentous hyphae, up to 8 µm diam, and elongate, inflated cells, up to 150 x 25 µm. LAMELLA TRAMA: bilateral; filamentous hyphae up to 7 µm diam, moderately branched, no clamps; inflated cells elongate, terminal or short, terminal chains. SUBHYMENIUM: hyphae cellular, no clamps. BASIDIA: up to 39 x 3.9-10.2 µm, 4-sterigmate, thin walled, no clamps. VOLVA: filamentous hyphae, moderately branched, up to 10 µm diam, no clamps. with few inflated cells, mostly broadly elliptic, usually terminal, up to 93 x 78 µm. STIPE TRAMA: filamentous hyphae inconspicuous, sparsely branched, up to 8 µm diam; inflated cells terminal, clavate to oblong-elliptic, longitudinally oriented, up to 271 x 25 µm.

SPORES: 7.8-10.2 x 7.0-10.2 µm ($\underline{E}$ = 1.0-1.10; $\overline{\underline{E}^{m}}$ = 1.04), globose to subglobose, hyaline, amyloid, thin walled; contents guttulate; apiculus sublateral, cylindric.

22. *Amanita prairiicola* Peck. 1897. Torr. Bot. Club Bull. 24: 138. Holotype (Implicit: cf. *des.* Bas, 1969): Kansas, Rooks Co., 17. ix. 1896, E. Bartholomew s.n.(NYS).

PILEUS: approximately 6 cm broad, plano-convex, margin slightly appendiculate, not striate, *white, more or less tinged with yellow*; volval remnants as subpyramidal to pyramidal warts, fairly small, randomly distributed, becoming fewer toward margin. LAMELLAE: moderately crowded, just reaching stem, *white*. STIPE: up to 7 x 0.7 cm, tapering slightly upward, expanded at apex, apparently solid, basal bulb very slight, *white or whitish*; annulus superior, membranous, narrow; no volval remnants remaining on base of stipe.

PILEIPELLIS: densely interwoven, gelatinized, filamentous hyphae. PILEUS TRAMA: undifferentiated, filamentous hyphae and elongate, inflated cells. LAMELLA TRAMA: bilateral; filamentous hyphae up to 8 µm diam, moderately branched, clamps rare; inflated cells elongate, terminal or short, terminal chains. SUBHYMENIUM: hyphae ramose to subcellular, clamped. BASIDIA: up to 54 x 5.5-14.8 µm, 4-sterigmate, abundantly clamped. VOLVA: filamentous hyphae on pileus sparsely to moderately branched, up to 9 µm diam, occasionally clamped; inflated cells mostly elliptic, oblong-elliptic to fusiform, up to 110 x 37 µm, terminal or short, terminal chains. STIPE TRAMA: filamentous hyphae sparsely branched, up to 8 µm diam, clamped; inflated cells terminal, mostly clavate, longitudinally oriented, up to 249 x 31 µm.

SPORES: 11.7-14.1 x 8.6-10.9 µm ($\underline{E}$ = 1.24-1.45; $\overline{\underline{E}^{m}}$ = 1.33), broadly elliptic to elliptic, often adaxially flattened, hyaline, amyloid, thin walled; contents guttulate; apiculus sublateral, cylindric.

23. *Amanitopsis pulverulenta* Peck. 1907. Bull. N. Y. St. Mus. 116: 17.
≡ *Amanita limbatula* Bas. 1969. Persoonia 5(4): 530.
Holotype (Implicit: cf. *des*. Bas, 1969): Port Jefferson, Suffolk Co., 18. viii. 1906, C. H. Peck s.n.(NYS).

PILEUS: approximately 3.5 cm broad, plano-convex, margin even, *white or creamy white*; volval remnants as a thin pulverulent layer and occasional floccose patches. LAMELLAE: free or just touching stipe, moderately broad, crowded, *white*. STIPE: approximately 3 x 0.6 cm, tapering slightly to apex, occasional slight flocculence, *white*, basal bulb elliptic to broadly elliptic; volva as a very slight, membranous limb on upper portion of bulb.

PILEIPELLIS: densely interwoven, gelatinized filamentous hyphae. PILEUS TRAMA: undifferentiated hyphae and elongate, inflated cells. LAMELLA TRAMA: bilateral; filamentous hyphae moderately branched, clamped; inflated cells elongate, usually terminal. SUBHYMENIUM: hyphae ramose to slightly inflated ramose, clamped. BASIDIA: up to 50 x 4-11 μm, 4-sterigmate, thin walled, clamped. VOLVA: remnants on pileus composed of filamentous hyphae and inflated cells; hyphae moderately branched, up to 8 μm diam, occasionally clamped; inflated cells globose to elliptic, up to 55 x 30 μm, with a few elongate, up to 80 x 35 μm, terminal or in short, terminal chains: volval material at base of stipe very similar to that on pileus. STIPE TRAMA: filamentous hyphae abundant, sparsely branched, and clamped; inflated cells terminal, clavate, longitudinally oriented, up to 330 x 37 μm.

SPORES: 8.6-10.2 x 3.9-5.5 μm ($\underline{E}$ = 1.83-2.21; $\underline{E^m}$ = 1.93), elongate to cylindric, often adaxially flattened, hyaline, amyloid, thin walled; contents guttulate; apiculus sublateral, truncate-conic.

24. *Amanita pusilla* Peck. 1897. Rep. N. Y. St. Mus. 50: 96.
non [*Amanita pusilla* Per. 1799. Obs. Myc. 2: 36].
Holotype (Implicit: *des. mihi*): New York - Gouverneur, St. Lawrence Co., 4. xi. 1896, Mrs. E. C. Anthony s.n.(NYS).

PILEUS: approximately 2.0-2.5 cm broad, plano-convex with slight umbo, rimose-areolate, margin not striate, *pale brown*. LAMELLAE: free, crowded, *becoming brownish*. STIPE: approximately 2 x 0.2-0.3 cm, tapering slightly upward, basal bulb subglobose to ovoid; slight membranous volva at apex of basal bulb.

Observation. This does not appear to be a member of the genus *Amanita*. Analysis of two characters indicates this: 1) the lamella trama is interwoven and not bilateral, and 2) the stipe trama does not have the "typical *Amanita* structure" (Hoffman, 1861: 11; Boudier, 1886: pl. 1, fig. 8; Bas, 1969: 328). Since there is a definite volval structure present, this might easily be a *Volvariella*. The identity could not be determined at this time due to the condition of the specimen and the lack of notes.

25. *Amanita radicata* Peck. 1900. Torr. Bot. Club Bull. 27: 609-610.
≡ *Amanita rhopalopus* Bas. 1969. Persoonia 5(4): 416-417.
Lectotype (cf. *des*. Bas, 1969): New Jersey, 26. vii. 1899, E. B. Sterling 114, s.n.(NYS).

PILEUS: approximately 5 cm broad, convex, margin even, inrolled, *white*; volval remnants as irregularly shaped, adnate warts densely covering pileus. LAMELLAE: free crowded, rather narrow. STIPE: approximately 6 x 1.6 cm, tapering upward, floccose-scaly, solid, *white*, basal bulb cylindrical to oblong-elliptic; annular remains thick, floccose-membranous, remaining attached to pileus margin; volval remnants as a few floccose patches on basal bulb.

PILEIPELLIS: densely interwoven to subradial, gelatinized, filamentous hyphae. PILEUS TRAMA: undifferentiated, filamentous hyphae and elongate, inflated cells. LAMELLA TRAMA: bilateral; filamentous hyphae up to 8 μm diam, moderately branched, occasionally clamped; inflated cells elongate, terminal or short, terminal chains. SUBHYMENIUM: hyphae ramose to inflated ramose, occasionally clamped. BASIDIA: up to 55 x 4-11 μm, 4-sterigmate, thin walled, occasionally clamped. VOLVA: filamentous hyphae on pileus moderately branched, up to 9 μm diam, occasionally clamped; inflated cells subglobose to broadly elliptic, up to 71.9 x 46.9 μm and oblong-elliptic to clavate, up to 110 x 37.6 μm, terminal or short, terminal chains: volval remnants at base of stipe very similar to above, but with a greater number of filamentous hyphae. STIPE TRAMA: filamentous hyphae moderately branched, up to 7 μm diam, occasionally clamped; inflated cells terminal, clavate, longitudinally oriented, up to 210 x 18 μm.

SPORES: 8.5-10.5 x 5.0-7.0 μm ($\underline{E}$ = 1.35-1.80; $\underline{E}^m$ = 1.55), elliptic to elongate, often adaxially flattened, hyaline, amyloid, thin walled; contents guttulate; apiculus sublateral, truncate-conic.

Typification. cf. Bas, 1969.

26. *Agaricus russuloides* Peck. 1873. Bull. Buff. Soc. Nat. Sci. 1(2): 41.
≡ *Amanita russuloides* (Pk.) Sacc. 1887. Syll. Fung. 5: 13.
Holotype (Implicit: *des. mihi*): New York - Greenbush, Rensselaer Co., no date, C. H. Peck s.n.(NYS).

PILEUS: approximately 3.5 cm broad, convex to plano-convex, margin striate, *pale yellow or straw color*; volval remnants as a few widely scattered, floccose patches. LAMELLAE: crowded, free but connected to stipe by a floccose line, *white*; lamellulae truncate. STIPE: approximately 3.5 x 0.2-0.5 cm, tapering slightly upward, stuffed, smooth, bulbous at base; no annulus; volva as a slight, free limb at the apex of the bulb with occasional floccose patches on lower stem.

PILEIPELLIS: densely interwoven to subradial, gelatinized, filamentous hyphae. LAMELLA TRAMA: bilateral; filamentous hyphae 3-8 μm diam, moderately branched, clamps not observed; inflated cells up to 130 x 25 μm, mostly clavate and irregularly elongate. SUBHYMENIUM: hyphae ramose, clamps not observed. BASIDIA: 39-50 x 4.1-12 μm, 4-sterigmate, clamps rarely observed. VOLVA: on pileus a loose to fairly dense tissue of apico-basal to irregularly disposed, terminal chains of clavate, elliptic, oblong-elliptic, astringo-cylindric inflated cells; cells up to 110 x 32 µm, with broadly elliptic and ovoid cells up to 64 x 40 µm; filamentous hyphae of volva 4-8 µm diam, moderately branched, clamps not observed: inflated cells of basal volva very similar to those on pileus with elliptic and ovoid cells larger, usually arranged in irregularly disposed, terminal chains; filamentous hyphae 3-8 µm diam, moderately branched, rarely clamped. STIPE TRAMA: filamentous hyphae up to 8 µm diam, sparsely branched, clamps rare; inflated cells up to 255 x 32 µm, clavate, terminal, longitudinally oriented.

SPORES: 8.7-10.2 x 6.3-7.0 µm ($\underline{E}$ = 1.24-1.49; $\underline{E}^m$ = 1.40), broadly elliptic to elliptic, adaxially flattened, thin walled, smooth, hyaline, nonamyloid; contents guttulate; apiculus sublateral, cylindric.

Typification. The specimen citation in the original description is very incomplete, and under ordinary circumstances would not suffice in type selection. However, this taxon appears to be rare, and Peck (1905) later stated that he had made no additional collections at Greenbush. Under these conditions I feel that the citation justifies the matching packet at NYS as the holotype (Lanjouw, 1966; Guide for the Determination of Types).

27. *Agaricus spretus* Peck. 1879. Rep. N. Y. St. Mus. 32: 24.
≡ *Amanita spreta* (Pk.) Sacc. 1887. Syll. Fung. 5: 12.
Holotype (Implicit: *des. mihi*): Sandlake, 1878, C. H. Peck s.n.(NYS).

PILEUS: approximately 10 cm broad, plano-convex to plane, flesh thin, margin strongly striate, *whitish or pale brown*; no volval remnants on pileus surface. LAMELLAE: free to just reaching stipe, moderately crowded, *white*; lamellulae truncate. STIPE: approximately 20 x 1.5 cm, tapering slightly upward, expanded at apex, stuffed, *white*, basal bulb not inflated; annulus superior, submembranous, fragmentary; volva thin, membranous, saccate, up to 3.5 cm deep, often adhering to stipe.

PILEIPELLIS: densely interwoven, gelatinized, filamentous hyphae. PILEUS TRAMA: undifferentiated, filamentous hyphae and elongate, inflated cells. LAMELLA TRAMA: bilateral; filamentous hyphae approximately 7 µm diam, moderately branched, occasionally clamped; inflated cells elongate, terminal or short, terminal chains. SUBHYMENIUM: hyphae ramose, clamped. BASIDIA: up to 49 x 4-14 µm, 4-sterigmate, walls thin, frequently clamped. VOLVA: layered at the base of the stipe; outer layer almost exclusively filamentous hyphae, moderately branched, up to 8 µm diam, no clamps; inflated cells rare, broadly elliptic to oblong-elliptic, terminal; inner layer very similar but with a larger number of inflated cells. STIPE TRAMA: filamentous hyphae undifferentiated and inconspicuous, sparsely branched, no clamps seen; inflated cells longitudinally oriented, clavate, terminal, up to 469 x 62.6 µm. PARTIAL VEIL: filamentous hyphae up to 7 µm diam, moderately branched, clamped; inflated cells rare.

SPORES: 10.2-13.3 x 5.5-7.0 µm ($\underline{E}$ = 1.62-2.11; $\underline{E}^m$ = 1.86), elongate to cylindric, often adaxially flattened, hyaline, nonamyloid, thin walled; contents guttulate; apiculus sublateral, cylindric.

28. *Amanita submaculata* Peck. 1900. Torr. Bot. Club Bull. 27: 609. Holotype (Implicit: *des. mihi*): North Carolina, vii. 1899, Miss M. L. Wilson s.n.(NYS).

PILEUS: approximately 7 cm broad, plano-convex, margin very slightly striate, *dark brown, more or less marked by whitish stripes or spots*; volval remnants as a single, floccose patch. LAMELLAE: moderately close, just reaching stipe, *white*. STIPE: approximately 6 x 0.6 cm, tapering slightly upward, expanded at apex, solid, *white*, basal bulb ovoid; annulus large, flaring membranous, very thin, *white*; no volval remnants remaining.

PILEIPELLIS: densely interwoven, gelatinized, filamentous hyphae. PILEUS TRAMA: undifferentiated, filamentous hyphae and elongate, inflated cells. LAMELLA TRAMA: bilateral; filamentous hyphae moderately branched, no clamps seen; inflated cells elongate, terminal or in short, terminal chains. BASIDIA: up to 60 x 5-14 μm, 4-sterigmate, thin walled, clamps not observed. VOLVA: filamentous hyphae on pileus relatively inconspicuous, sparsely branched, up to 7 μm diam, no clamps observed; inflated cells abundant, primarily subglobose to broadly elliptic, with a few oblong-elliptic, mostly terminal chains. STIPE TRAMA: filamentous hyphae sparsely branched, up to 7 μm diam, no clamps observed; inflated cells terminal, clavate, longitudinally oriented, up to 281 x 31 μm.

SPORES: 7.0-8.6 x 4.7-6.4 μm ($\underline{E}$ = 1.22-1.83; $\underline{E^m}$ = 1.59), broadly elliptic to elongate, often adaxially flattened, hyaline, amyloid, thin walled; contents guttulate; apiculus sublateral, cylindric.

29. *Amanitopsis velosa* Peck. 1895. Torr. Bot. Club Bull. 22: 485.
≡ *Amanita velosa* (Pk.) Lloyd. 1898. Volvae: 9,15.
Holotype (Implicit: *des. mihi*): California - Pasadena, under Oak trees, iv. 1895, A. J. McClatchie s.n.(NYS).

PILEUS: approximately 5 cm broad, plane to plano-convex, margin slightly inrolled, striate, *buff or orange-buff*; volval remnants as large,*whitish*, felty patches, randomly distributed and frequently covering a large portion of the pileus. LAMELLAE: crowded, just reaching the stipe, *pale cream color*; lamellulae truncate. STIPE: approximately 9 x 0.6 cm, tapering upward, slightly at apex, stuffed, *white or whitish*, basal bulb not distinct; no annular remains; volva very thick and membranous-felty, remote or adhering to stipe.

PILEIPELLIS: densely interwoven, gelatinized, filamentous hyphae. PILEUS TRAMA: undifferentiated, filamentous hyphae and variform, inflated cells, terminal or short, terminal chains. LAMELLA TRAMA: bilateral; filamentous hyphae up to 8 μm diam, moderately branched, no clamps; inflated cells mostly elongate, terminal or short, terminal chains. SUBHYMENIUM: hyphae ramose to slightly inflated ramose, no clamps. BASIDIA: up to 62 x 5.6-15 μm, 4-sterigmate, walls thin, no clamps. VOLVA: on pileus composed primarily of filamentous hyphae, irregularly disposed, moderately branched, up to 8 μm diam, no clamps;

inflated cells usually elliptic, up to 78.3 x 46.9 μm, terminal: tissue of volva at the stipe base very similar to that of pileus, but with a slightly larger number of inflated cells. STIPE TRAMA: filamentous hyphae undifferentiated and quite abundant, sparsely branched, up to 7 μm diam, no clamps; inflated cells terminal, clavate, longitudinally oriented, up to 343 x 43 μm.

SPORES: 9.4-10.9 x 7.8-9.4 μm ($\underline{E}$ = 1.09-1.27; $\underline{E}^m$ = 1.16), subglobose to broadly elliptic, often adaxially flattened, hyaline, nonamyloid, thin walled; contents guttulate; apiculus sublateral, truncate-conic.

30. *Agaricus volvatus* Peck. 1872. Rep. N. Y. St. Mus. 24: 59.
≡ *Amanita volvata* (Pk.) Lloyd. 1898. Volvae: 9, 15.
Holotype (Implicit: *des. mihi*): Greenbush, no date, C. H. Peck s.n. (NYS).

PILEUS: approximately 4.7 cm broad, plano-convex, flesh moderately thick, margin faintly striate, *whitish, the disk pale brown*; volval remnants as thin, floccose patches, randomly distributed, but concentrated on disc. LAMELLAE: free, crowded, *white*. STIPE: approximately 6 x 0.7 cm, tapering upward, slightly expanded at apex, stuffed, *whitish*; no annulus; volva saccate, thick membranous, margin lobed, up to 3.5 cm deep.

PILEIPELLIS: densely interwoven, slightly gelatinized, filamentous hyphae. PILEUS TRAMA: undifferentiated, filamentous hyphae, up to 9 μm diam, and elongate, inflated cells. LAMELLA TRAMA: bilateral; filamentous hyphae up to 7 μm diam, moderately branched, no clamps observed; inflated cells elongate, terminal or short, terminal chains. BASIDIA: up to 46 x 4-11 μm, 4-sterigmate, thin walled, no clamps observed. VOLVA: at base of stipe layered; outer layer composed primarily of filamentous hyphae, up to 9 μm diam, moderately branched, no clamps observed; inflated cells few, broadly elliptic up to 72 x 59.5 μm, and elongate up to 78.3 x 21.9 μm, terminal; inner layer very similar, but with a greater number of inflated cells: volval material on pileus very similar to that on the inside layer of the basal volva. STIPE TRAMA: filamentous hyphae inconspicuous, sparsely branched, up to 7 μm diam, no clamps observed; inflated cells terminal, clavate, longitudinally oriented, up to 218 x 21 μm.

SPORES: 8.6-10.2 x 5.5-7.0 μm ($\underline{E}$ = 1.34-1.58; $\underline{E}^m$ = 1.48), elliptic, often adaxially flattened, hyaline, amyloid, thin walled; contents guttulate; apiculus sublateral, cylindric.

31. *Amanitopsis volvata* var. *elongata* Peck. 1900. Rep. N. Y. St. Mus. 53: 856, pl. A, fig. 6-10.
Holotype (Implicit: *des. mihi*): Claryville, no date, C. H. Peck s.n. (NYS).

PILEUS: approximately 6.3 cm broad, plano-convex to plane, *white*, margin slightly striate, glabrous, flesh moderately thin; no volval remnants remaining. LAMELLAE: free, moderately crowded. STIPE: approximately 10 x 0.7 cm, tapering slightly upward, slightly floccose-mealy; basal bulb elliptic; no annular remains; volva saccate, membranous, moderately thick, lobed, up to 2 cm deep.

PILEIPELLIS: densely interwoven, gelatinized, filamentous hyphae. PILEUS TRAMA: undifferentiated, filamentous hyphae, up to 8 μm diam, moderately branched and elongate, inflated cells. LAMELLA TRAMA: bilateral; filamentous hyphae up to 8 μm diam, moderately branched, no clamps; inflated cells elongate, terminal or short, terminal chains. SUBHYMENIUM: hyphae ramose to inflated ramose, no clamps observed. BASIDIA: up to 47 x 4-7.8 μm, 4-sterigmate, thin walled, clamps not observed. VOLVA: filamentous hyphae at base of stipe moderately branched, up to 8 μm diam, clamps not observed; inflated cells elliptic to clavate, terminal, up to 93.9 x 31.3 μm, with a very few, small, subglobose to elliptic. STIPE TRAMA: filamentous hyphae sparsely branched, up to 9 μm diam, no clamps seen; inflated cells terminal, clavate, longitudinally oriented, up to 249 x 21.9 μm.

SPORES: 10.2-11.7 x 4.7-6.2 μm ($\underline{E}$ = 1.85-2.32; $\underline{E^m}$ = 2.02), elongate to cylindrical, often adaxially flattened, hyaline, amyloid, thin walled; contents guttulate; apiculus sublateral, cylindric to truncate-conic.

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# A NEW STATUS FOR THE BROWN *PARMELIAE*

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Generic concepts in lichens have been undergoing extremely rapid change recently, especially in large and ubiquitous families like the Parmeliaceae. In his work with the large and heterogeneous genus *Parmelia*, Hale (1974 a, b, c, d; 1976) has created eight new segregate genera just since 1974. Recently (Esslinger, 1977), I published a revision of the brown species of *Parmelia* in which three major infrageneric taxa, the subgenera *Allantoparmelia*, *Melanoparmelia*, and *Neofusca*, were recognized. At the time of the original research and writing of that paper, I wavered between treating the three taxa as independent genera or as subgenera, deciding finally to follow the more conservative path of recognition as subgenera. The time span between writing the paper and its final publication proved to be rather long, however, and well before it appeared in print, I was convinced that recognition at the level of genus would have been more natural and more indicative of the remote relationships between the three taxa involved. The descriptions and/or new combinations necessitated by recognition at the level of genus are presented below. The evidence supporting the recognition of three independent taxa are presented in my original paper and will not be repeated here.

The following key outlines the major distinctions between the three genera to be recognized. As with most genera, there is no single character that will distinguish between any two of the three. Rare exceptions to almost all character differences do occur, hence the relative complexity of the key.

-Lower surface erhizinate and the upper cortex $HNO_3$-; foliose to subcrustose species characteristic of rock (or rarely soil) substrates in boreal or arctic-alpine areas.................................... *Allantoparmelia*

-Lower surface rhizinate or the upper cortex $HNO_3$+ blue-green or both
  -Upper cortex $HNO_3$+ blue-green or rarely violet (in one North American species and one South African species); foliose to commonly subcrustose or subfruticose species characteristic of rock or soil substrates primarily in temperate areas.......... .................................. *Neofuscelia*
  -Upper cortex $HNO_3$- (rarely $HNO_3$+ violet in two eurasion species); foliose species of deverse substrates (including rock), most common in north temperate to boreal or arctic-alpine areas........ .................................. *Melanelia*

*ALLANTOPARMELIA* (Vain.) Essl., stat. nov.
Basionym: *Parmelia* subgenus *Allantoparmelia* Vain., Ark. Bot. 8(4): 32. 1909.
Type species: *Allantoparmelia alpicola* (Th. Fr.) Essl.

*Allantoparmelia almquistii* (Vain.) Essl., comb. nov.
Basionym: *Parmelia almquistii* Vain, Ark. Bot. 8(4): 32. 1909.
*Allantoparmelia alpicola* (Th. Fr.) Essl., comb. nov.
Basionym: *Parmelia alpicola* Th. Fr., Lichenes Arctoi: 57. 1860.
*Allantoparmelia sibirica* (Zahlbr.) Essl., comb. nov.
Basionym: *Parmelia sibirica* Zahlbr., Catalog. Lichen. Univers. 6: 47. 1930. (as nom. nov. for *P. nigra* Vain., Ark. Bot. 8(4): 31. 1909).

*MELANELIA* Essl., gen. nov.

Thallus foliosus, laxus vel modice adnatus, lobis 0.4-11 mm latis, brevibus et rotundatis vel elongatis, plus minusve planis. Superne vulgo sorediatus isidiatus vel pseudocyphellatus, $HNO_3$ non reagens vel raro $HNO_3$+ violaceus. Subtus modice vel sparse rhizinosus.

Type species: *Melanelia stygia* (L.) Essl.
Synonym: *Parmelia* subgenus *Melanoparmelia* (Hue) Essl., J. Hattori Bot. Lab. 42: 46. 1977.

subgenus *MELANELIA*
*Melanelia disjuncta* (Erichs.) Essl., comb. nov. Basionym: *Parmelia disjuncta* Erichs., Ann. Mycol. 37: 78. 1939. (as nom. nov. for *P. sorediata* var. *coralloidea* Lynge, Lichens from Novaya Zemlya: 200. 1928).
*Melanelia panniformis* (Nyl.) Essl., comb, nov. Basionym: *Parmelia prolixa* f. *panniformis* Nyl., Synop. Method. Lichen.: 397. 1860.

*Melanelia predisjuncta* (Essl.) Essl., comb. nov. Basionym: *Parmelia predisjuncta* Essl., J. Hattori Bot. Lab. 42: 50. 1977.

*Melanelia sorediosa* (Almb.) Essl., comb. nov. Basionym: *Parmelia sorediosa* Almb. in Krok & Almquist, Svensk Flora for Skolor 2, Kryptogamer, ed. 6: 134. 1947. (as nom. nov. for *P. sorediata* (Ach.) Th. Fr., Lichenes Arctoi: 56. 1860. Basionym: *Parmelia stygia* β. *P. sorediata* Ach., Lichenogr. Univers.: 471. 1810).

*Melanelia stygia* (L.) Essl., comb. nov. Basionym: *Lichen stygius* L., Spec. Pl. 2: 1143. 1753.

*Melanelia substygia* (Räs.) Essl., comb. nov. Basionym: *Parmelia substygia* Räs., Lichenes Fenniae Exs. 51. 1935.

subgenus *OLIVASCENTES* (Harm.) Essl., stat. nov. Basionym: *Parmelia* sect. *Amphigymnia* A. *Olivascentes* Harm., Lichens de France 4: 571. 1909. Type species: *Melanelia acetabulum* (Neck.) Essl.

*Melanelia acetabulum* (Neck.) Essl., comb. nov. Basionym: *Lichen acetabulum* Neck., Delic. Gallo-Belgic. Silvestr. 2: 506. 1768.

*Melanelia koflerae* (Clauzade & Poelt) Essl., comb. nov. Basionym: *Parmelia koflerae* Clauzade & Poelt, Nova Hedwigia 3: 368. 1961.

subgenus *VAINIOËLLAE* (Gyeln.) Essl., stat. nov. Basionym: *Parmelia* subgenus *Euparmelia* sect. *Vainioëllae* Gyeln., Repert. Spec. Nov. Regni Veg. 30: 220. 1932. Type species: *Melanelia glabra* (Schaer.) Essl.

*Melanelia albertana* (Ahti) Essl., comb. nov. Basionym: *Parmelia albertana* Ahti, Bryologist 72: 236. 1969.

*Melanelia calva* (Essl.) Essl., comb. nov. Basionym: *Parmelia calva* Essl., J. Hattori Bot. Lab. 42: 60. 1977.

*Melanelia elegantula* (Zahlbr.) Essl., comb. nov. Basionym: *Parmelia olivacea* * *P. aspidota* var. *elegantula* Zahlbr., Verh. Vereins Natur- und Heilk. Pressburg 8: 39. 1894.

*Melanelia exasperata* (De Not.) Essl., comb. nov. Basionym: *Parmelia exasperata* De Not., Giorn. Bot. Ital. 2: 193. 1847.

*Melanelia exasperatula* (Nyl.) Essl., comb. nov. Basionym: *Parmelia exasperatula* Nyl., Flora 56: 299. 1873.

*Melanelia fuscosorediata* (Essl.) Essl., comb. nov. Basionym: *Parmelia fuscosorediata* Essl., J. Hattori Bot. Lab. 42: 68. 1977.

*Melanelia glabratula* (Lamy) Essl., comb. nov. Basionym:

*Parmelia olivacea* α *corticola* a. *glabra* Schaer., Lichenum Helveticorum Spicilegium: 466. 1840.

*Melanelia glabratula* (Lamy) Essl., comb. nov. Basionym: *Parmelia fuliginosa* * *P. glabratula* Lamy, Bull. Soc. Bot. France 30: 353. 1883.

*Melanelia glabratuloides* (Essl.) Essl., comb. nov. Basionym: *Parmelia glabratuloides* Essl., J. Hattori Bot. Lab. 42: 72. 1977.

*Melanelia glabroides* (Essl.) Essl., comb. nov. Basionym: *Parmelia glabroides* Essl., J. Hattori Bot. Lab. 42: 72. 1977.

*Melanelia halei* (Ahti) Essl., comb. nov. Basionym: *Parmelia halei* Ahti, Acta Bot. Fenn. 70: 38. 1966.

*Melanelia huei* (Asah.) Essl., comb. nov. Basionym: *Parmelia huei* Asah., J. Jap. Bot. 26: 194. 1951.

*Melanelia infumata* (Nyl.) Essl., comb. nov. Basionym: *Parmelia infumata* Nyl., Flora 58: 359. 1875.

*Melanelia laciniatula* (Flag. ex Oliv.) Essl. comb. nov. Basionym: *Parmelia exasperatula* var. *laciniatula* Flag. ex Oliv., Rev. Bot. Bull. Mens. 12: 69. 1894.

*Melanelia multispora* (Schneid.) Essl., comb. nov. Basionym: *Parmelia multispora* Schneid., A Guide to the Study of Lichens: 154. 1898.

*Melanelia olivacea* (L.) Essl., comb. nov. Basionym: *Lichen olivaceus* L., Spec. Pl.: 1143. 1753.

*Melanelia olivaceoides* (Krog) Essl., comb. nov. Basionym: *Parmelia olivaceoides* Krog, Norsk Polarinst. Skr. 144: 109. 1968.

*Melanelia piliferella* (Essl.) Essl., comb. nov. Basionym: *Parmelia piliferella* Essl., J. Hattori Bot. Lab. 42: 83. 1977.

*Melanelia pseudoglabra* (Essl.) Essl., comb. nov. Basionym: *Parmelia pseudoglabra* Essl., J. Hattori Bot. Lab. 42: 84. 1977.

*Melanelia septentrionalis* (Lynge) Essl., comb. nov. Basionym: *Parmelia olivacea* var. *septentrionalis* Lynge, Bergens Mus. Årbok 1912(10): 4. 1912.

*Melanelia subargentifera* (Nyl.) Essl., comb. nov. Basionym *Parmelia subargentifera* Nyl., Flora 58: 359. 1875.

*Melanelia subaurifera* (Nyl.) Essl., comb. nov. Basionym: *Parmelia subaurifera* Nyl., Flora 56: 22. 1873.

*Melanelia subelegantula* (Essl.) Essl., comb. nov. Basionym *Parmelia subelegantula* Essl., J. Hattori Bot. Lab. 42: 89. 1977.

*Melanelia subglabra* (Ras.) Essl., comb. nov. Basionym: *Parmelia subaurifera* var. *subglabra* Ras., Ann. Bot. Soc Zool.-Bot. Fenn. "Vanamo" 2: 19. 1932.

*Melanelia subolivacea* (Nyl.) Essl., comb. nov. Basionym: *Parmelia subolivacea* Nyl. in Hasse, Bull. Torrey Bot. Club 24: 445. 1897.

*Melanelia trabeculata* (Ahti) Essl., comb. nov. Basionym: *Parmelia trabeculata* Ahti, Acta Bot. Fenn. 70: 54. 1966.

*Melanelia ushuaiensis* (Zahlbr.) Essl., comb. nov. Basionym: *Parmelia ushuaiensis* Zahlbr., Kungl. Svenska Vetenskapsakad. Handl. 57: 42. 1917.

*Melanelia villosella* (Essl.) Essl., comb. nov. Basionym: *Parmelia villosella* Essl., J. Hattori Bot. Lab. 42: 95. 1977.

*Melanelia zopheroa* (Essl.) Essl., comb. nov. Basionym: *Parmelia zopheroa* Essl., J. Hattori Bot. Lab. 42: 96. 1977.

*NEOFUSCELIA* Essl., gen. nov.

Thallus foliosus vel interdum subcrustosus vel subfruticosus, laxus vel arctus adnatus, lobis 0.1-5 mm latis, brevibus et rotundatis vel lineari-elongatis, plus minusve planis vel convexis. Superne sorediis pseudocyphellisque destitutus, vulgo isidiatus; persaepe $HNO_3$+ aeruginosus vel atrovirens, raro $HNO_3$+ violaceus vel non reagans. Subtus plerumque rhizinosus.

Type species: *Neofuscelia pulla* (Ach.) Essl.

Synonym: *Parmelia* subgenus *Neofusca* (Gyeln.) Essl., J. Hattori Bot. Lab. 42: 97. 1977.

subgenus *NEOFUSCELIA*

*Neofuscelia adpicta* (Zahlbr.) Essl., comb. nov. Basionym: *Parmelia adpicta* Zahlbr., Akad. Wiss. Math.-Naturwiss. Kl., Denkschr. 104: 351. 1941.

*Neofuscelia ahtii* (Essl.) Essl., comb. nov. Basionym: *Parmelia ahtii* Essl., J. Hattori Bot. Lab. 42: 99. 1977.

*Neofuscelia applicata* (Stizenb.) Essl., comb. nov. Basionym: *Parmelia prolixa* var. *applicata* Stizenb., Ber. Thatigk. St. Gall. Naturwiss. Ges. 1887-88: 163. 1889.

*Neofuscelia attica* (Leuckert et al.) Essl., comb. nov. Basionym: *Parmelia prolixa* var. *attica* Leuckert et al. in *Vězda, Lich. Sel. Exs. 1069.* 1972.

*Neofuscelia atticoides* (Essl.) Essl., comb. nov. Basionym: *Parmelia atticoides* Essl., J. Hattori Bot. Lab. 42: 101. 1977.

*Neofuscelia brattii* (Essl.) Essl., comb. nov. Basionym: *Parmelia brattii* Essl. in C. F. Culb. & Essl., Bryologist 79: 42. 1976.

*Neofuscelia brunella* (Essl.) Essl., comb. nov. Basionym: *Parmelia brunella* Essl., J. Hattori Bot. Lab. 42: 103. 1977.

*Neofuscelia cafferensis* (Essl.) Essl., comb. nov. Basionym: *Parmelia cafferensis* Essl., J. Hattori Bot. Lab. 42: 104. 1977.

*Neofuscelia caliginosa* (Essl.) Essl., comb. nov. Basionym: *Parmelia caliginosa* Essl., J. Hattori Bot. Lab. 42: 105. 1977.

*Neofuscelia conturbata* (Müll. Arg.) Essl., comb. nov. Basionym: *Parmelia conturbata* Müll. Arg., Flora 71: 9. 1888.

*Neofuscelia crustulosa* (Essl.) Essl., comb. nov. Basionym: *Parmelia crustulosa* Essl., J. Hattori Bot. Lab. 42. 106. 1977.

*Neofuscelia delisei* (Duby) Essl., comb. nov. Basionym: *Parmelia olivacea* var. *delisei* Duby, Botan. Gall. 2: 602. 1830.

*Neofuscelia dregeana* (Hampe) Essl., comb. nov. Basionym: *Parmelia dregeana* Hampe in Nyl., Syn. Method. Lichen.: 398. 1858-60.

*Neofuscelia epheboides* (Zahlbr.) Essl., comb. nov. Basionym: *Parmelia epheboides* Zahlbr., Akad. Wiss. Wien. Math.-Naturwiss. Kl., Denkschr. 104: 353. 1941.

*Neofuscelia erythrocardia* (Müll. Arg.) Essl., comb. nov. Basionym: *Parmelia prolixa* var. *erythrocardia* Müll. Arg., Flora 62: 290. 1879.

*Neofuscelia fissurina* (Zahlbr.) Essl., comb. nov. Basionym: *Parmelia fissurina* Zahlbr., Ann. Mycol. 34: 172. 1936.

*Neofuscelia foveolata* (Essl.) Essl., comb. nov. Basionym: *Parmelia foveolata* Essl., J. Hattori Bot. Lab. 42: 111. 1977.

*Neofuscelia glabrans* (Nyl.) Essl., comb. nov. Basionym: *Parmelia glabrans* Nyl., Flora 58: 15. 1875.

*Neofuscelia imitatrix* (Tayl.) Essl., comb. nov. Basionym: *Parmelia imitatrix* Tayl., Lond. J. Bot. 63: 161. 1847.

*Neofuscelia incantata* (Essl.) Essl., comb. nov. Basionym: *Parmelia incantata* Essl., J. Hattori Bot. Lab. 42: 115. 1977.

*Neofuscelia incomposita* (Essl.) Essl., comb. nov. Basionym: *Parmelia incomposita* Essl., J. Hattori Bot. Lab. 42: 116. 1977.

*Neofuscelia infrapallida* (Essl.) Essl., comb. nov. Basionym: *Parmelia infrapallida* Essl., J. Hattori Bot. Lab. 42: 116. 1977.

*Neofuscelia kenyana* (Essl.) Essl., comb. nov. Basionym: *Parmelia kenyana* Essl., J. Hattori Bot. Lab. 42: 117. 1977.

*Neofuscelia lichinoidea* (Nyl. ex Crombie) Essl., comb. nov. Basionym: *Parmelia lichinoidea* Nyl. ex Crombie, J. Bot. 14: 19. 1876.

*Neofuscelia lineella* (Essl.) Essl., comb. nov. Basionym: *Parmelia lineella* Essl., J. Hattori Bot. Lab. 42: 118. 1977.

*Neofuscelia loriloba* (Essl.) Essl., comb. nov. Basionym: *Parmelia loriloba* Essl., J. Hattori Bot. Lab. 42: 119. 1977.

*Neofuscelia loxodella* (Essl.) Essl., comb. nov. Basionym: *Parmelia loxodella* Essl. in C.F. Culb. & Essl., Bryologist 79: 43. 1976.

*Neofuscelia loxodes* (Nyl.) Essl., comb. nov. Basionym: *Parmelia loxodes* Nyl., Flora 55: 426. 1872.

*Neofuscelia luteonotata* (J. Stein.) Essl., comb. nov. Basionym: *Parmelia luteonotata* J. Stein., Verh. K. K. Zool.-Bot. Ges. Wien 12: 472. 1902.

*Neofuscelia martinii* (Essl.) Essl., comb. nov. Basionym: *Parmelia martinii* Essl., J. Hattori Bot. Lab. 42: 123. 1977.

*Neofuscelia melancholica* (J. Stein. & Zahlbr.) Essl., comb. nov. Basionym: *Parmelia melancholica* J. Stein. & Zahlbr. in Zahlbr., Bot. Jahrb. Syst. 60: 507. 1926.

*Neofuscelia melanobarbatica* (Essl.) Essl., comb. nov. Basionym: *Parmelia melanobarbatica* Essl., J. Hattori Bot. Lab. 42: 124. 1977.

*Neofuscelia minuta* (Essl.) Essl., comb. nov. Basionym: *Parmelia minuta* Essl., J. Hattori Bot. Lab. 42: 125. 1977.

*Neofuscelia nakuruensis* (Essl.) Essl. comb. nov. Basionym: *Parmelia nakuruensis* Essl., J. Hattori Bot. Lab. 42: 126. 1977.

*Neofuscelia namaënsis* (J. Stein. & Zahlbr.) Essl., comb. nov. Basionym: *Parmelia namaënsis* J. Stein. & Zahlbr. in Zahlbr. Bot. Jahrb. Syst. 60: 508. 1926.

*Neofuscelia occidentalis* (Essl.) Essl., comb. nov. Basionym: *Parmelia occidentalis* Essl., J. Hattori Bot. Lab. 42: 128. 1977.

*Neofuscelia parviloba* (Essl.) Essl., comb. nov. Basionym: *Parmelia parviloba* Essl., J. Hattori Bot. Lab. 42: 129. 1977.

*Neofuscelia peloloba* (Essl.) Essl., comb. nov. Basionym: *Parmelia peloloba* Essl., J. Hattori Bot. Lab. 42: 129. 1977.

*Neofuscelia petriseda* (Zahlbr.) Essl., comb. nov. Basionym: *Parmelia petriseda* (Zahlbr., Akad. Wiss. Wien., Math.-Naturwiss. Kl., Denkschr. 104: 352. 1941.

*Neofuscelia pictada* (Essl.) Essl., comb. nov. Basionym: *Parmelia pictada* Essl. in C. F. Culb. et al., Bryologist 80: 131. 1977.

*Neofuscelia plana* (Essl.) Essl., comb. nov. Basionym: *Parmelia plana* Essl., J. Hattori Bot. Lab. 42: 132. 1977.

*Neofuscelia pokornyi* (Essl.) Essl., comb. nov. Basionym: *Imbricaria pokornyi* Korb. in Pokorny, Verh. K.-K. Zool.-Bot. Ges. Wien 10: 285. 1860.

*Neofuscelia prolixula* (Nyl. ex Crombie) Essl., comb. nov. Basionym: *Parmelia prolixula* Nyl. ex Crombie, J. Bot. 14: 19. 1876.

*Neofuscelia pulla* (Ach.) Essl. comb. nov. Basionym: *Parmelia pulla* Ach., Synop. Method. Lichen.: 206. 1814.

*Neofuscelia pulloides* (Essl.) Essl., comb. nov. Basionym: *Parmelia pulloides* Essl., J. Hattori Bot. Lab. 42: 138. 1977.

*Neofuscelia pustulosa* (Essl.) Essl. comb. nov. Basionym: *Parmelia pustulosa* Essl., J. Hattori Bot. Lab. 42: 139. 1977.

*Neofuscelia pyrenaica* (Essl.) Essl., comb. nov. Basionym: *Parmelia pyrenaica* Essl., J. Hattori Bot. Lab. 42: 140. 1977.

*Neofuscelia ryssolea* (Ach.) Essl., comb. nov. Basionym: *Dufourea ryssolea* Ach., Lichenogr. Univers.: 525. 1810.

*Neofuscelia scabrella* (Essl.) Essl., comb. nov. Basionym: *Parmelia scabrella* Essl. in C. F. Culb. et al., Bryologist 80: 134. 1977.

*Neofuscelia serpulina* (Essl.) Essl., comb. nov. Basionym: *Parmelia serpulina* Essl., J. Hattori Bot. Lab. 42: 143. 1977.

*Neofuscelia spesica* (Essl.) Essl., comb. nov. Basionym: *Parmelia spesica* Essl., J. Hattori Bot. Lab. 42: 143. 1977.

*Neofuscelia squamans* (Stizenb.) Essl., comb. nov. Basionym: *Parmelia squamans* Stizenb., Ber. Thatigk. St. Gall. Naturwiss. Ges. 1887-88: 164. 1889.

*Neofuscelia squamariata* (Nyl. ex Crombie) Essl., comb. nov. Basionym: *Parmelia squamariata* Nyl. ex Crombie, J. Bot. 14: 19. 1876.

*Neofuscelia stygiodes* (Nyl. ex Crombie) Essl., comb. nov. Basionym: *Parmelia stygiodes* Nyl. ex Crombie, J. Bot. 13: 333. 1875.

*Neofuscelia subhosseana* (Essl.) Essl., comb. nov. Basionym: *Parmelia subhosseana* Essl., J. Hattori Bot. Lab. 42: 148. 1977.

*Neofuscelia subimitatrix* (Essl.) Essl., comb. nov. Basionym: *Parmelia subimitatrix* Essl., J. Hattori Bot. Lab. 42: 149. 1977.

*Neofuscelia subincerta* (Essl.) Essl., comb. nov. Basionym: *Parmelia subincerta* Essl., J. Hattori Bot. Lab. 42: 150. 1977.

*Neofuscelia subverrucella* (Essl.) Essl., comb. nov. Basionym: *Parmelia subverrucella* Essl. in C. F. Culb. et al., Bryologist 80: 133. 1977.

*Neofuscelia tatimirix* (Essl.) Essl., comb. nov. Basionym: *Parmelia tatimirix* Essl., J. Hattori Bot. Lab. 42: 151. 1977.

*Neofuscelia tentaculina* (Essl.) Essl., comb. nov. Basionym: *Parmelia tentaculina* Essl., J. Hattori Bot. Lab. 42: 151. 1977.

*Neofuscelia trachythallina* (Essl.) Essl., comb. nov. Basionym: *Parmelia trachythallina* Essl., J. Hattori Bot. Lab. 42: 152. 1977.

*Neofuscelia verisidiosa* (Essl.) Essl., comb. nov. Basionym: *Parmelia verisidiosa* Essl., J. Hattori Bot. Lab. 42: 153. 1977.

*Neofuscelia verrucella* (Essl.) Essl., comb. nov. Basionym: *Parmelia verrucella* Essl. in C. F. Culb. et al., Bryologist 42: 154. 1977.

*Neofuscelia verruculifera* (Nyl.) Essl., comb. nov. Basionym: *Parmelia verruculifera* Nyl., Flora 61: 247. 1878.

*Neofuscelia waiporiensis* (Hillm.) Essl., comb. nov. Basionym: *Parmelia waiporiensis* Hillm., Repert. Spec. Nov. Regni Veg. 45: 173. 1938.

subgenus *ATROVIRIDIS* (Essl.) Essl., stat. nov. Basionym: *Parmelia* subgenus *Neofusca* section *Atroviridis* Essl., J. Hattori Bot. Lab. 42: 157. 1977. Type species: *Neofuscelia atroviridis* (Essl.) Essl.

*Neofuscelia atroviridis* (Essl.) Essl., comb. nov. Basionym: *Parmelia atroviridis* Essl., J. Hattori Bot. Lab. 42: 157. 1977.

*Neofuscelia chiricahuensis* (R. Anderson & W. Web.) Essl., comb. Basionym: *Parmelia chiricahuensis* R. Anderson & W. Web., Bryologist 65: 234. 1962.

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MYCOTAXON

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# A NEW MEXICAN SPECIES IN THE LICHEN GENUS *EVERNIASTRUM* HALE (PARMELIACEAE)

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Hale (1976) established the lichen genus *Everniastrum* to include species previously grouped in *Parmelia* subgenus *Everniiformes* (Hue) Hale & Wirth (Hale & Wirth, 1971). Hale's (1976) synopsis of *Everniastrum* included 21 species of which 12 are known from Mexico. This paper describes a new species, *Everniastrum mexicanum* Egan, the thirteenth Mexican taxon.

## EVERNIASTRUM MEXICANUM Egan, sp. nov.

Thallus (Fig. 1) ut in *Everniastrum neocirrhatum* (Hale & Wirth) Hale sed differt acidum protocetraricum continente.

Thallus subfruticose, to 15 cm broad, mineral gray above; lobes linear, 1-2 mm wide, elongate, channeled, with a pored epicortex (Fig. 3), lacking soredia and isidia; margins of lobes sparsely short ciliate (Fig. 4); lower surface smooth and very sparsely rhizinate, colored white to tan near the ends of the lobes, turning brown to black toward the center of the thallus; apothecia frequent, up to 8 mm in diameter, imperforate, subterminal; pycnidia common; white maculae inconspicuous or lacking; asci globose; spores hyaline, non-septate, ellipsoid or kidney bean-shaped, 8 per ascus, 7-10 x 14-18 μm.

Chemistry: cortex K+ yellow, medulla K-, C-, KC-, P+ orange-red, atranorin and protocetraric acid.

Holotype: MEXICO. Jalisco: Municipio de Jalpa, Cumbre del Tejamanil, pine-oak forest, 2200 m, on trees, *R. Gonzáles*, 25 October 1971 (US; isotypes at Texas A&M University-Biology Department Herbarium, and MIN). Since

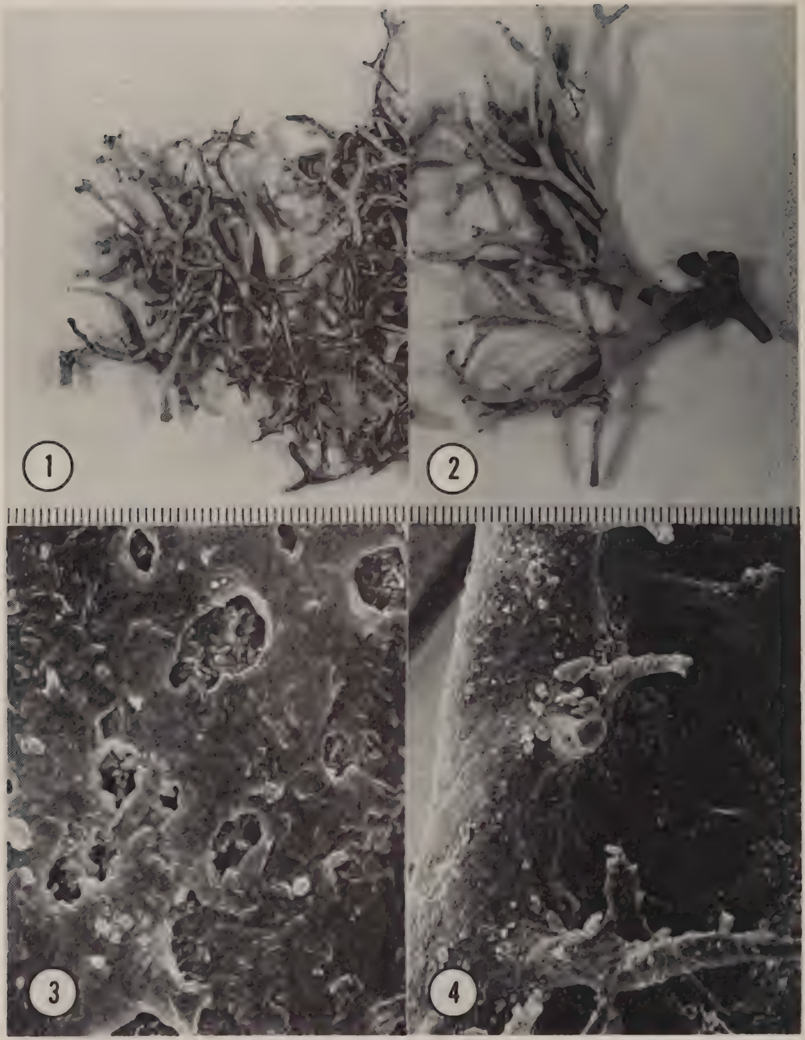

Figure 1: *Everniastrum mexicanum*, portion of the holotype (US). Scale in mm. Figure 2: *E. pachydermum*, portion of *B. Rambo 102* from Porto Alegre, Brazil (US). Scale in mm. Figure 3: *E. mexicanum*, SEM photograph of upper surface showing pored epicortex (X 2000). Figure 4: *E. mexicanum*, SEM photograph of a single lobe showing marginal cilia and rhizines (X 160).

material upon which this species is based was sent in exchange from Dr. Gastón Guzmán in Mexico City, I assume that an additional isotype may also be located at ENCB. The material I received was abundant in the packet and chemically uniform.

As in several other *Everniastrum* species, *E. mexicanum* is morphologically indistinguishable from *E. neocirrhatum* (Hale & Wirth) Hale, the most widespread and abundant *Everniastrum* species in Mexico (Hale, 1976). Chemically it is identical to *E. limaeforme* (Tayl.) Hale (Hale, pers. comm.), *E. arsenei* (Hale & Wirth) Hale, and *E. pachydermum* (Hue) Hale, all producing the medullary depsidone protocetraric acid. However, *E. limaeforme* is isidiate, *E. arsenei* is very densely rhizinate below, and *E. pachydermum* is a more robust, coriaceous plant with broader lobes, longer and more abundant cilia and rhizines, a black lower surface, and distinct white maculae on the upper surface (Fig. 2). It grows on rocks and soil in southern Brazil, Argentina, and Uruguay (Hale, 1976). *E. neocirrhatum*, although morphologically identical, produces norstictic, salazinic, and protolichesterinic acids.

I thank Dr. Mason E. Hale, Jr. (US) for the loan of material of *E. pachydermum* for comparison and for his critical comments on the manuscript. I thank Dr. Gastón Guzmán (ENCB) for sending the material of this new species.

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# PEZIZA UMBILICATA KARSTEN, AN OLDER BUT UNAVAILABLE NAME FOR PEZIZA OSTRACODERMA, APOTHECIAL PEAT MOULD

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For many years the junior author avoided proposing a new species in the genus *Peziza* for what he considered to be an undescribed species with the peculiar anamorphic state now known as *Chromelosporium fulvum* (Link) McGinty, Hennebert & Korf *in* Hennebert & Korf, or as *C. ollare* (Pers.) Hennebert. This is the common "peat mould" of greenhouses, mushroom beds and firesites known also under a variety of misapplied names (Hennebert & Korf, 1975). When the apothecial (teleomorphic) state was described as a new species, *Plicaria fulva* Schneider (1954), the junior author was unable to transfer that epithet to *Peziza* because of an earlier homonym, *P. fulva* Micheli *ex* Persoon (1822), and he thus proposed a new name for Schneider's discomycete, *Peziza ostracoderma* Korf (1961).

One additional name was later found (Hennebert & Korf, 1975) for the apothecial state, *Discina cinerophila* Sturgis *in* Ellis & Everhart, published in 1896, but without a description and hence not validly published and unusable.

The senior author has recently discovered that P. A. Karsten described this species from Scandinavia a century ago as *Peziza umbilicata* Karsten (1868), with a description on the label of his Fungi Fenniae Exsiccati #729. We have both compared Karsten's exsiccati with recent collections of *Peziza ostracoderma*, and there is no doubt that they are synonyms. Cooke (1877) failed to illustrate the reticulum (FIG. 1) on the ascospores, which were shown as warted; Schneider (1954)

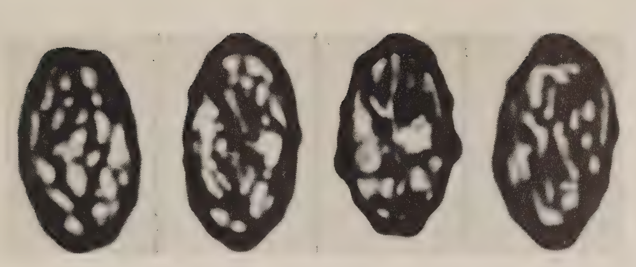

FIG. 1. *Photomicrographs of ascospores from Karsten, F. Fenn. Exs. 729(K), ×2000. Photos by H.D.*

made the same error in interpretation of the spore ornamentation, corrected by Korf (1961). We have chosen the Kew Herbarium specimen of Karsten, Fungi Fenniae Exsiccati #729 as the LECTOTYPE for this name; other portions of this collection in other herbaria become ISOLECTOTYPES of *P. umbilicata.*

Unfortunately, Karsten's name cannot be applied to the apothecial state of peat mould when it is treated in *Peziza* since it is a later homonym of the much earlier *P. umbilicata* Persoon (1822). [A still later homonym, *P. umbilicata* Berk. & Curt. *in* Berkeley (1875), does not affect Karsten's name.] Karsten's name is surely worthy of note in that it provides the earliest available epithet which can and should be used if the apothecial state of peat mould is treated in another genus (though in the process it will lose direct reference to Karsten). As a later homonym, Karsten's name is illegitimate [Art. 64, International Code of Botanical Nomenclature (Stafleu, 1972)]. But when Saccardo (1889) catalogued Karsten's species as "*Discina umbilicata* Karst.," the epithet took on new life since there was no earlier homonym of it in that genus; the correct author citation for it is *D. umbilicata* Sacc., not *D. umbilicata* (Karst.) Sacc. as one might normally assume (Art. 72, Note, ICBN). Since some authors do not circumscribe *Peziza* in the way we do, but would prefer to range the species in *Galactinia, Plicaria,* or some other genus, Saccardo's epithet should be used there in a new combination, not Schneider's (1954) nor Korf's (1961). The type specimen of Saccardo's name is automatically Karsten's type specimen, designated above.

Hennebert & Korf (1975) provided a full synonymy of both the anamorphic and the teleomorphic states of peat mould. The apothecial (teleomorphic) synonymy should be expanded from that given by them:

PEZIZA OSTRACODERMA Korf *in* Mycologia 52: 650. 1961 ('1960'), *a name change.*

≡ *Plicaria fulva* Schneider *in* Zentralbl. Bakteriol. Hyg. 2 Abt. 108: 153. 1954, non *Peziza fulva* [Mich.] Pers. 1822.

= *Peziza umbilicata* Karst., Fungi Fenn. Exs. 729. 1868, *nom. illegit.* (later homonym), nec *P. umbilicata* Pers. 1822 nec *P. umbilicata* Berk. & Curt. *in* Berk. 1875.

≡ *Discina umbilicata* Sacc., Syll. Fung. 8: 100. 1889 (ut "Karst.").

= [*Discina cinerophila* Sturgis *in* Ellis & Everh., North Am. Fungi 3500. 1896, *nomen nudum.*]

## *ACKNOWLEDGEMENTS*

We wish to thank the Director of the Royal Botanic Gardens, Kew, for the opportunity to examine the Karsten exsiccati specimen, Professor Donald H. Pfister, Farlow Herbarium, Harvard University for bibliographic assistance, and Prof. Pfister and Miss Linda M. Kohn, Cornell University, for editorial suggestions. The junior author acknowledges financial assistance from National Science Foundation Grant DEB75-23557.

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# THE USE OF PIGMENTS AS A TAXONOMIC CHARACTER TO DISTINGUISH SPECIES OF THE TRICHIACEAE (MYXOMYCETES)

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## INTRODUCTION

For several decades taxonomists studying many groups of organisms have been redefining old terms and defining new ones in order to express the principles of the "New Systematics." It appears that the emphasis has been rightly shifted from merely naming static forms to understanding the interactions of individuals within populations and the relationships between one population and the next.

When one compares the taxonomy of the Myxomycetes to the taxonomy of many other groups it appears to be far behind. Intrinsic features of the group which make it difficult to proceed beyond this alpha taxonomic level and to apply methods of biosystematics include:

1) Large series of specimens are lacking for many species.

2) The sporophore of the Myxomycetes is morphologically simple so that even when a few additional plasmodial characters can be used, the total number of characters is still small, and the range of variation due to environmental or genetic differences is not well known nor statistically analyzed.

3) The fact that myxomycete spores are wind disseminated over wide areas and the absence of quantifiable characters adds to the difficulty of interpreting any information on populations in nature.

4) Because of their small size, it is difficult to obtain enough field collected material for use of biochemical techniques.

5) Although cultural techniques can overcome some of these problems by providing readily available material, only about 70 of 450 species have been grown from spore to spore in agar culture (Clark and Collins, 1977).

Needless to say, myxomycete taxonomy is bound by a rigid type concept, and although herbarium studies are necessary, other approaches are possible and should be used. This experimental method has been emphasized by Alexopoulos (1969). The present report is a result of a search for additional characters which might be useful in assessing interspecific and intraspecific variation in the Trichiaceae.

Pigment analysis has been of great benefit to systematists of a number of groups of organisms (Arpin and Fiasson, 1971; Harborne *et al*, 1973). This technique has been applied to four species of the Trichiaceae and is reliable in distinguishing them along established morphological lines. In addition, intraspecific variation found in three of the species may be useful as a populational marker or an environmental indicator depending upon whether these variations are genetically or environmentally controlled. It is significant that this technique provides an additional taxonomic character from small amounts of herbarium material of organisms that we have not been able to grow in culture.

## MATERIALS AND METHODS

Specimens from the University of Texas Myxomycete Collection (UTMC), a personal collection (MB), and the University of Michigan Herbarium (MICH) used in this study are listed below. Identification of all specimens was made or verified using the keys of Martin and Alexopoulos (1969).

Pigments of two to four entire sporangia from each collection were extracted in 95% ethanol for one half hour at room temperature. The extracts were spotted on Bakerflex Silica Gel 1B thin layer chromatography plates (Baker Chemical Co., Phillipsburg, N. J.) and developed in a solvent designed for pteridine pigments containing 2% ammonium acetate: n-propanol (1:1) and 0.25% mercaptoethanol for up to ten hours (Descimon and Barial, 1966). Even minor temperature or humidity fluctuations affect the results and care must be taken so that comparisons may be made of plates developed at different times. On some occasions basic fuschin was used as a reference standard. Developed chromatographs were examined under UV light.

Specimens:

*Hemitrichia calyculata* (Speg.) Farr
UTMC 265 - Iowa, 13 VI 1959, C. J. Alexopoulos
UTMC 384 - Pennsylvania, 26 VI 1957, C. J. Alexopoulos, Pa-30
UTMC 477 - Texas, VI 1964, C. D. Therrien
UTMC 891 - Jamaica, 21 I 1966, C. J. Alexopoulos, Jam-62
UTMC 921 - Guadeloupe, 24 XII 1965, C. J. Alexopoulos
UTMC 1091 - Dominica, 10 I 1966, M. L. Farr, 2121
UTMC 1325 - Virginia, 14 VII 1967, C. J. Alexopoulos
UTMC 1426 - Costa Rica, 1 VI 1963, J. A. Sáenz, UCR-31
UTMC 1429 - Costa Rica, 24 IX 1964, J. A. Sáenz, UCR-203
UTMC 1610 - Thailand, 19 VIII 1967, D. Reynolds, 1202
UTMC 1851 - Florida, 15 VII 1961, D. Creager, 388

*Hemitrichia clavata* (Pers.) Rost.
UTMC 259 - Iowa, 25 IX 1958, C. J. Alexopoulos, Ia-60
UTMC 574 - Arkansas, 1 I 1965, T. E. Brooks, 2733
UTMC 658 - Washington, XII 1912, T. H. Macbride
UTMC 1961 - Texas, 30 III 1969, H. Henney, Jr.
MICH (4) - Michigan, 1 X 1956, V. Potter, 11627
MICH (5) - Michigan, 23 IX 1956, V. Potter, 11580

*Hemitrichia serpula* (Scop.) Rost.
UTMC 17 - Mexico, B. Lowy, M85
UTMC 225 - InterAmerican Hwy. Km 135, 13 IX 1964, G. C. Carroll
UTMC 1281 - Tennessee, 21 III 1967, R. H. Petersen
UTMC 1418 - Costa Rica, 20 V 1963, J. A. Sáenz, UCR20
UTMC 1419 - Costa Rica, 29 VII 1963, J. A. Sáenz, UCR102
UTMC 1420 - Costa Rica, 30 VIII 1963, J. A. Sáenz, UCR108
UTMC 1998 - Costa Rica, 22 III 1966, E. F. Morris, 982

*Metatrichia vesparium* (Batsch.) Nann.-Brem.
MB (1) - Virginia (?), Goldman
MB (2) - Virginia (?), E. W. Elliott
MB (3) - Virginia (?), 1949, R. E. Carrigan
MICH (6) - Michigan, 27 IX 1956, V. Potter, 11617
MICH (7) - Michigan, 12 VIII 1956, V. Potter, 11063
MICH (8) - Michigan, 8 IX 1931, E. B. Mains, 31-171
MICH (9) - Massachusetts, 1902, B. M. Davis
MICH (10) - New Hampshire, 1910, W. G. Farlow
MICH (11) - California, 29 XII 1942, P. and M. Rea
MICH (12) - Michigan, X 1890, V. M. Spaulding
MICH (13) - Michigan, 16 VII 1946, T. E. Brooks, 1154
MICH (14) - Michigan, 29 X 1931, E. B. Mains, 31-511
MICH (15) - Michigan, 1 VIII 1956, V. Potter, 10962

## OBSERVATIONS

Chromatographic data from entire sporangia of four species of trichiaceous Myxomycetes are presented in Table 1. In visible light the spots appear pale yellow or orange; color of UV fluorescence is shown in Table 1. Although all of the specimens examined exhibit certain common spots, there are interspecific differences in the total patterns. Spots 2 and 4 (Table 1) are present in all four of the species. *Hemitrichia calyculata* is easily detectable because it has spot 9 which has a greater $R_f$ value than any of the other spots and fluoresces purple in UV light. The chromatograms of the other species lack spot 9. *Hemitrichia serpula* and *Metatrichia vesparium* are different from *H. clavata* and *H. calyculata* by the lack of spot 1. *Metatrichia vesparium* has spot 8, but unlike spot 7 of other species which has the same $R_f$ value, it does not fluoresce in UV light.

Intraspecific differences are evident. They cannot be correlated with collection locality, known habitat differences, or specimen age and treatment. Even specimens which appeared faded gave chromatographic results recognizable for the species; in these cases since less pigment was available more alcoholic extract had to be applied to the chromatographic plate.

| Spot | $R_f$ | u-v | UTMC17 | UTMC225 | UTMC1281 | UTMC1418 | UTMC1419 | UTMC1420 | UTMC1998 |
|---|---|---|---|---|---|---|---|---|---|
| 9 | .91 | purple | | | | | | | |
| 8/7 | .87 | none<br>orange | | X | X | X | X | X | X |
| 6 | .59 | purple | | X | | X | | | |
| 5 | .50 | yellow | X | X | X | X | X | X | X |
| 4 | .41 | yellow | X | X | X | X | X | X | X |
| 3 | .38 | orange | | X | | | | | |
| 2 | .34 | yellow | X | X | X | X | X | X | X |
| 1 | .18 | yellow | | | | | | | |
| 0 | 0 | none | X | X | X | X | X | X | X |
| | | | *H. serpula* | | | | | | |

| Spot | $R_f$ | u-v | UTMC265 | UTMC384 | UTMC477 | UTMC891 | UTMC921 | UTMC1090 | UTMC1325 | UTMC1426 | UTMC1429 | UTMC1610 | UTMC1851 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 9 | .91 | purple | X | X | X | X | X | X | X | X | X | X | X |
| 8/7 | .87 | none<br>orange | | | | | | | | | | | |
| 6 | .59 | purple | | X | X | | | | | | | | X |
| 5 | .50 | yellow | | | | | | | | | | | |
| 4 | .41 | yellow | X | X | X | X | X | X | X | X | X | X | X |
| 3 | .38 | orange | | | | | | | | | | | |
| 2 | .34 | yellow | X | X | X | X | X | X | X | X | X | X | X |
| 1 | .18 | yellow | X | X | X | X | X | X | X | X | X | X | X |
| 0 | 0 | none | X | X | X | X | X | X | X | X | X | X | X |
| | | | *H. calyculata* | | | | | | | | | | |

| Spot | $R_f$ | u-v | UTMC259 | UTMC574 | UTMC658 | UTMC1961 | MICH(4) | MICH(5) |
|---|---|---|---|---|---|---|---|---|
| 9 | .91 | purple | | | | | | |
| 8/7 | .87 | none<br>orange | | X | | X | | |
| 6 | .59 | purple | | | | | | |
| 5 | .50 | yellow | | | | | | |
| 4 | .41 | yellow | X | X | X | X | X | X |
| 3 | .38 | orange | | | | | | |
| 2 | .34 | yellow | X | X | X | X | X | X |
| 1 | .18 | yellow | X | X | X | X | X | X |
| 0 | 0 | none | X | X | X | X | X | X |
| | | | *H. clavata* | | | | | |

| Spot | $R_f$ | u-v | MB(1) | MB(2) | MICH(3) | MICH(6) | MICH(7) | MICH(8) | MICH(9) | MICH(10) | MICH(11) | MICH(12) | MICH(13) | MICH(14) | MICH(15) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 9 | .91 | purple | | | | | | | | | | | | | |
| 8/7 | .87 | none<br>orange | X | X | X | X | X | X | X | X | X | X | X | X | X |
| 6 | .59 | purple | | | | | | | | | | | | | |
| 5 | .50 | yellow | | | | | | | | | | | | | |
| 4 | .41 | yellow | X | X | X | X | X | X | X | X | X | X | X | X | X |
| 3 | .38 | orange | | | | | | | | | | | | | |
| 2 | .34 | yellow | X | X | X | X | X | X | X | X | X | X | X | X | X |
| 1 | .18 | yellow | X | | | | | | | | | | | | |
| 0 | 0 | none | X | X | X | X | X | X | X | X | X | X | X | X | X |
| | | | *M. vesparium* | | | | | | | | | | | | |

## DISCUSSION

Plasmodial pigments in some physaraceous slime molds may act as photoreceptors in presporulation events (Daniel, 1966; Rakoczy, 1963; Wormington and Weaver, 1977) and are retained in the sporangia. The fact that none of these pigments is yet chemically characterized points to the complexity of the components. Less is known of the pigments present in the sporangia of triacheaceous species; even plasmodial color is not known for some of these species, nor is it known whether these pigments act as photoreceptors during sporulation.

Although the species tested appear to contain common pigment components, until the chemical nature of these pigments, their possible function, and the environmental and genetic influences upon them are known this character is of no phylogenetic use. But, in the species observed, differences in pigment profiles do correlate with morphological species and provide an additional character at this level.

Variation within morphological species may indicate environmental or genetic variation. During routine culture of species of *Physarum*, differences in sporangial pigmentation may sometimes be correlated with lighting conditions. This phenomenon was experimentally studied by Brandza (1926a, 1926b) who placed pieces of the same plasmodia in conditions of shade and direct sunlight and found that color (intensity) varied in the sporangia which developed. On the other hand, the extreme differences in plasmodial color of certain isolates of *Didymium iridis* (Ditmar) Fries have been shown to be genetically determined (Collins and Clark, 1966; Collins, 1966).

We are continuing this survey of trichiaceous species to see if others can be characterized on the basis of pigment components and are looking at laboratory cultured specimens of physaraceous species in order to determine if infraspecific differences are environmentally or genetically controlled.

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We express our appreciation to Dr. C. J. Alexopoulos and Dr. R. L. Shaffer, who loaned specimens, and to Dr. P. Van Faa who read an early manuscript. Financial support from a Mellon Faculty Development Grant (to MB) and NSF-URP SM176-83612 (to is gratefully acknowledged.

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# A CHECKLIST OF THE OPERCULATE CUP-FUNGI (PEZIZALES) OF NORTH AMERICA WEST OF THE GREAT PLAINS

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This checklist is based upon published records and upon specimens in several, but by no means all, major North American Herbaria. Those Herbaria which have been searched with some thoroughness are those at Bureau of Plant Industry, Beltsville (BPI); Cornell Univ. (CUP); Oregon State Univ. (OSC); San Francisco State Univ. (SFS); Univ. of British Columbia (UBC); Univ. of Washington (WTU); and Washington State Univ. (WSP). Herbarium abbreviations are after Lanjouw and Staffleu (34) with the following two additions. (RMD) represents the private herbarium of Dr. R. M. Danielson of the Dept. of Biology, Univ. of Calgary, Calgary, Alberta. (W-K) represents the private herbarium of Virginia Wells and Phyllis Kempton in Anchorage, Alaska.

The list consists of 231 species arranged in seven families. The families and, with rare exceptions, the genera are those recognized by Korf (31). The inclusion of some names and the exclusion of others has involved a series of arbitrary decisions by the authors. Where a recent monograph is available (e.g. ref. no. 3) the species concepts and synonymies of its authors have been followed. The references which follow each species include descriptions of the species. Commonly used synonyms are given for species only where the correct species epithet differs from that used in the references cited. Those species for which occurrence records have not yet been verified by either author or by recent monographers are marked with an asterisk, and additional species of dubious record are cited by name only at the end of the checklist.

Appended to the list are eight additional species whose previous generic placement is unsatisfactory according to current discomycete taxonomy. Most of these are species for which transfers should be made in the near future.

# Order PEZIZALES

## Suborder SARCOSCYPHINEAE

### Family SARCOSOMATACEAE

Nannfeldtiella aggregata Eckblad
Distr: ALB.
Herb: OSC, R. P. Korf (?), (RMD)
Refs: 11

Neournula pouchetii (Berthet & Riousset) Paden
Distr: B.C., ID, OR, WA
Herb: ID, OSC, UBC, WSP
Refs: 46, 47

Plectania melastoma (Sow. ex Fr.) Fuckel
Distr: B.C., CA, CO, ID, OR, WA
Herb: BPI, CUP, OSC, SFS, UBC, WSP
Refs: 9, 56

Plectania milleri Paden & Tylutki
Distr: ID, OR
Herb: ID, OSC, WSP
Refs: 48

Plectania nannfeldtii Korf
Distr: ALB., B.C., CO, ID, OR, WA
Herb: OSC, (RMD), SFS, WSP
Refs: 30, 42

Pseudoplectania melaena (Fr.) Boud.
Distr: B.C., ID, OR, WA
Herb: ID, NY, OSC, UBC, WSP
Refs: 56

Pseudoplectania nigrella (Pers. ex Fr.) Fuckel
Distr: B.C., CA, CO, ID, OR, UT, WA, WY
Herb: CUP, OSC, SFS, UBC, WSP, WTU
Refs: 9, 56

Sarcosoma latahensis Paden & Tylutki
Distr: ID, OR, WA
Herb: OSC, WSP
Refs: 48

Sarcosoma mexicana (Ellis & Holway) Paden & Tylutki
Distr: B.C., ID, OR, WA
Herb: OSC, UBC, WSP, WTU
Refs: 48

Urnula hiemalis Nannf.
Distr: AK, ALB.
Herb: (RMD), (W-K)
Refs: 21

### Family SARCOSCYPHACEAE

Desmazierella acicola Lib.
Distr: OR
Herb: OSC
Refs: 9

_Microstoma protracta_ (Fr.) Kanouse
Distr: ALB., CO
Herb: CUP, NY, OSC, (RMD)
Refs: 15
_Pithya cupressina_ (Fr.) Fuckel
Distr: B.C., CA, ID, OR, WA
Herb: NY, OSC, SFS, UBC, WSP, WTU
Refs: 56
_Pithya vulgaris_ Fuckel
Distr: B.C., CA, ID, OR, WA
Herb: NY, OSC, SFS, UBC, WSP
Refs: 56
_Pseudopithyella minuscula_ (Boud. & Torrend) Seaver
Distr: CA, OR
Herb: NY, OSC
Refs: 56
_Sarcoscypha coccinea_ (Jacq. ex Gray) Lambotte
Distr: B.C., CA, OR, WA
Herb: BPI, CUP, NY, OSC, SFS, UBC
Refs: 56

## Suborder PEZIZINAE

### Family ASCOBOLACEAE

_Ascobolus albidus_ Crouan
Distr: AK, WA, WY
Herb: OSC, TRTC, WSP
Refs: 3
*_Ascobolus boudieri_ Quél.
Distr: WA
Herb: WTU
Refs: 3
_Ascobolus brassicae_ Crouan
Distr: CA
Herb: FH
Refs: 3
_Ascobolus carbonarius_ Karst.
Distr: ALB., B.C., CA, OR
Herb: NY, OSC, SFS, UBC, WTU
Refs: 3
*_Ascobolus crenulatus_ Karst.
Distr: ID
Herb: WSP
Refs: 3
_Ascobolus denudatus_ Fr.
Distr: CA
Herb: BPI
Refs: 3
_Ascobolus doliiformis_ Kobayasi
Distr: AK
Herb: BPI
Refs: 26

Ascobolus foliicola Berk. & Br.
Distr: CA, CO, OR
Herb: BPI, NY, OSC
Refs: 3
Ascobolus furfuraceus Pers. ex Pers.
Distr: B.C., CA, CO, ID, OR, WA
Herb: CUP, NY, OSC, WSP
Refs: 3
Ascobolus geophilus Seaver
Distr: CO, ID, OR
Herb: BPI, NY
Refs: 3
Ascobolus immersus Pers. ex Pers.
Distr: AZ, B.C., CO
Herb: NY, UBC
Refs: 3
Ascobolus lignatilis Alb. & Schw. ex Pers.
Distr: OR
Herb: OSC
Refs: 3
Ascobolus michaudii Boud.
Distr: B.C.
Herb: CUP, DOAM, UVIC
Refs: 3
Ascobolus nodulosporus van Brumm.
Distr: CA
Herb: FH
Refs: 3
Ascobolus sacciferus van Brumm.
Distr: B.C., CA, WA
Herb: CUP, UC, UVIC
Refs: 3
Ascobolus scatigenus (Berk.) van Brumm.
Distr: CA
Herb: S
Refs: 3
Ascobolus viridis Currey
Distr: OR
Herb: OSC
Refs: 3
Ascobolus xylophilus Seaver
Distr: CO
Herb: NY
Refs: 3
Iodophanus carneus (Pers.) Korf
Distr: CA, CO, ID, WA
Herb: NY, OSC, WSP
Refs: 25, 55, 56
Iodophanus testaceus (Moug. in Fr.) Korf
Distr: OR, WA
Herb: OSC, WTU
Refs: 25, 56
Saccobolus depauperatus (Berk.& Br.) Hansen
Distr: AK, CO, ID, OR
Herb: BPI, NY, WSP
Refs: 3, 27

Saccobolus glaber (Pers.) Lambotte
  Distr: CO
  Herb: BPI, NY
  Refs: 3
Saccobolus versicolor (Karst.) Karst.
  Distr: CA, CO, ID, OR
  Herb: BPI, CUP, NY, OSC, WSP
  Refs: 3
*Sphaerosoma hesperium (Setch.) Seaver
  Distr: CA
  Herb: NY
  Refs: 56, 58
Thecotheus agranulosus Kimbr.
  Distr: OR, YUKON
  Herb: MICH, OSC
  Refs: 23, 56
Thecotheus apiculatus Kimbr.
  Distr: OR
  Herb: NY
  Refs: 23
Thecotheus cinereus (Crouan & H. Crouan) Chenantais
  Distr: CA, CO, ID, OR, UT
  Herb: NY, WSP
  Refs: 23
*Thecotheus pelletieri (Crouan) Boud.
  Distr: OR, WA
  Herb: NY, WTU
  Refs: 23, 56

Family PEZIZACEAE

Pachyella adnata (Berk. & Curt.) Pfister
  Distr: MT, WA, WY
  Herb: BPI, CUP-D, NY, R. P. Korf, WTU
  Refs: 49, 51
Pachyella babingtonii (Berk.) Boud.
  Distr: CO, ID, MT, OR, WA
  Herb: CUP, MICH, NY, OSC
  Refs: 49, 51
Pachyella clypeata (Schw.) LeGal
  Distr: CA, OR
  Herb: BPI, NY, OSC
  Refs: 49, 51
Peziza alaskana Cash
  Distr: AK
  Herb: BPI (?), WSP
  Refs: 5
Peziza ammophila Dur. & Mont.
  Distr: CA, OR
  Herb: NY, OSC
  Refs: 9
Peziza ampliata Pers.
  Distr: AZ, OR
  Herb: OSC
  Refs: 9

_Peziza apiculata_ Cooke
Distr: AZ
Herb: OSC
Refs: 56
_Peziza arvernensis_ Boud.
Distr: ALB., ID, OR, UT
Herb: OSC, (RMD), WSP
Refs: 9, 36
_Peziza badia_ Pers. ex Mérat
Distr: AK, ALB., B.C., CA, CO, ID, NM, OR, WA
Herb: BPI, CUP, DOAM, NY, OSC, SFS, UBC, WSP, WTU
Refs: 9, 12, 56
_Peziza badioconfusa_ Korf
Distr: B.C., CA, ID, MACK. DIST., OR, UT, WA
Herb: DOAM, NY, OSC, WSP
Refs: 9, 12, 58, 61
_Peziza badiofusca_ (Boud.) Dennis
Distr: WA
Herb: WSP
Refs: 9
_Peziza brunneoatra_ Desm.
Distr: CA, CO, ID, OR, WA
Herb: BPI, NY, OSC, WSP
Refs: 9, 56
*_Peziza brunneovinosa_ Clem.
Distr: OR
Herb: OSC
Refs: 56
_Peziza cerea_ Sow. ex Mérat
Distr: NV, OR
Herb: BPI, OSC
Refs: 9
*_Peziza concentrica_ Seaver
Distr: CA, OR
Herb: NY
Refs: 56
_Peziza domiciliana_ Cooke
Distr: B.C., CA, OR, UT, WA
Herb: BPI, NY, OSC, SFS, UBC, WSP, WTU
Refs: 56
_Peziza echinospora_ Karst.
Distr: AZ, CO, ID, NM, OR, UT
Herb: OSC, WSP
Refs: 9
_Peziza emeleia_ Cooke
Distr: CA, CO, OR, UT
Herb: BPI, OSC
Refs: 9
_Peziza fimeti_ (Fuckel) Seaver
Distr: CO, OR, UT, WA
Herb: NY, OSC, SFS
Refs: 56
*_Peziza griseorosea_ Gerard
Distr: NM
Herb: NY
Refs: 56

Peziza limnaea Maas G.
=P. limosa (Grelet) Nannf.
Distr: AK, OR, WA
Herb: OSC
Refs: 27, 36

Peziza michelii (Boud.) Dennis
Distr: OR
Herb: OSC
Refs: 9

Peziza micropus Pers.
Distr: CO
Herb: OSC
Refs: 9

Peziza ostracoderma Korf
Distr: OR, WA
Herb: OSC, WSP
Refs: 29

Peziza paludicola Boud.
Distr: OR
Herb: OSC
Refs: 9

Peziza petersii Berk. & Curt.
Distr: B.C., OR, WA
Herb: OSC
Refs: 9

Peziza praetervisa Bres.
Distr: ALB., CO, ID, OR
Herb: OSC, (RMD), WSP
Refs: 9, 61

Peziza proteana (Boud.) Seaver
Distr: CA, OR, WA
Herb: BPI, OSC, SFS, WTU
Refs: 9, 56, 62

*Peziza pustulata Pers.
Distr: CA, WA, WY
Herb: NY, SFS, WSP
Refs: 56

Peziza repanda Pers. ex Pers.
Distr: B.C., CA, CO, ID, MT, OR, WA, WY
Herb: BPI, CUP, NY, OSC, SFS, WSP
Refs: 9, 56

Peziza sepiatra Cooke
Distr: B.C., CO
Herb: BPI, OSC, UVIC
Refs: 9

*Peziza spissa Berk.
Distr: WA
Herb: NY
Refs: 56

Peziza succosa Berk.
Distr: B.C., CA, OR, WA
Herb: BPI, NY, OSC, UBC
Refs: 9, 56

*Peziza sterigmatizans* Phillips
Distr: OR, WA
Herb: OSC
Refs: 9
*Peziza sylvestris* (Boud.) Sacc. & Trott.
Distr: B.C., CA, ID, OR, UT, WA, WY
Herb: BPI, NY, OSC, SFS, UBC, WSP, WTU
Refs: 56, 57
*Peziza varia* (Hedwig) Fr.
Distr: ID
Herb: WSP
Refs: 9
*Peziza vesiculosa* Bull. ex Fr.
Distr: B.C., CA, CO, ID, OR, WA
Herb: BPI, CUP, NY, OSC, SFS, WSP, WTU
Refs: 9, 56
*Peziza violacea* Pers.
Distr: B.C., CA, CO, ID, OR, UT, WA
Herb: NY, OSC, SFS, UBC, WSP, WTU
Refs: 9, 56
*Plicaria carbonaria* (Fuckel) Fuckel
=*P. trachycarpa* var. *muricata* Grelet
Distr: ALB., OR
Herb: OSC, (RMD)
Refs: 9, 60
*Plicaria endocarpoides* (Berk.) Rifai
=*P. leiocarpa* (Currey) Boud.
Distr: B.C., CA, ID, MT, OR, WA
Herb: CUP, NY, OSC, UBC, WSP, WTU
Refs: 9, 56
*Plicaria trachycarpa* (Currey) Boud.
Distr: B.C., CO, ID, OR, WA
Herb: NY, UBC, WSP, WTU
Refs: 9, 56
*Sarcosphaera crassa* (Santi ex Steudl) Pouzar
=*S. coronaria* (Jacq. ex Cooke) Boud.
Distr: ALB., AZ, B.C., CA, CO, ID, NM, OR, UT, WA
Herb: BPI, CUP, NY, OSC, (RMD), SFS, UBC, WSP
Refs: 9, 56

Family MORCHELLACEAE

*Disciotis venosa* (Pers. ex Fr.) Boud.
Distr: CA, CO, ID, NM, OR, UT
Herb: BPI, CUP, NY, OSC, SFS, WSP
Refs: 9, 56
*Morchella angusticeps* Peck
Distr: ALB., CA, CO, ID, UT, WA
Herb: OSC, (RMD), SFS, WSP
Refs: 56
**Morchella crassipes* (Ventenat) Pers.
Distr: CA, ID, WY
Herb: SFS, WSP
Refs: 56

*Morchella elata* Fr.
Distr: B.C., CA, ID, OR, WA, WY
Herb: CUP, NY, OSC, SFS, WSP, WTU
Refs: 9, 56
*Morchella esculenta* Pers. ex St.-Amans
Distr: ALB., CA, CO, ID, MT, OR, UT, WA
Herb: CUP, NY, OSC, (RMD), SFS, UBC, WSP, WTU
Refs: 9, 56
*Morchella semilibera* DC. ex Fr.
Distr: ID, OR, WA
Herb: NY, OSC, WSP
Refs: 9, 56
*Ptychoverpa bohemica* (Krombholz) Boud.
Distr: AK, ALB., B.C., CA, ID, OR, WA
Herb: CUP, NY, OSC, (RMD), SFS, UBC, WSP
Refs: 9, 62
*Verpa conica* Swartz ex Pers.
Distr: ALB., B.C., CA, CO, ID, OR, WA
Herb: NY, OSC, (RMD), SFS, UBC, WSP, WTU
Refs: 9, 56

## Family HELVELLACEAE

*Discina apiculata* McKnight
Distr: CA, ID, UT, WY
Herb: BPI, BRY, FH, MICH
Refs: 38
*Discina larryi* McKnight
Distr: UT
Herb: BPI
Refs: 41
*Discina leucoxantha* Bres.
Distr: ID, OR, UT
Herb: BRY, OSC, WSP
Refs: 38
*Discina macrospora* Bubák
Distr: B.C., OR
Herb: CUP, FH
Refs: 38
*Discina melaleuca* Bres.
Distr: CO, ID, OR, WA
Herb: OSC, WSP
Refs: 56
*Discina olympiana* Kanouse
Distr: WA, WY
Herb: BPI, MICH
Refs: 38
*Discina perlata* (Fr.) Fr.
Distr: AK, ALB., B.C., CA, CO, ID, MT, OR, UT, WA, WY
Herb: BPI, BRY, CUP, FH, MICH, NY, OSC, (RMD), WSP, WTU
Refs: 38
*Gyromitra ambigua* (Karst.) Harmaja
Distr: AK, ALB.
Herb: (RMD)
Refs: 20

*Gyromitra californica* (Phillips) Raitviir
Distr: B.C., CA, CO, ID, NV, OR, WA
Herb: CUP, NY, OSC, SFS, UBC, WSP, WTU
Refs: 56

*Gyromitra caroliniana* (Bosc ex Fr.) Fr.
Distr: B.C., CA, CO, OR, WA
Herb: NY, OSC, UBC, WTU
Refs: 14, 40

*Gyromitra esculenta* Fr.
Distr: ALB., B.C., CA, CO, ID, OR, WA, WY
Herb: CUP, OSC, (RMD), SFS, UBC, WSP, WTU
Refs: 9

*Gyromitra fastigiata* (Krombholz) Rehm
Distr: ALB
Herb: (RMD)
Refs: 42

*Gyromitra gigas* (Krombholz) Quél.
Distr: CA, CO, ID, OR, UT, WA
Herb: OSC, SFS, WSP
Refs: 56

*Gyromitra infula* (Schaeffer ex Fr.) Quél.
Distr: AK, ALB., AZ, B.C., CA, CO, ID, OR, UT, WA
Herb: CUP, NY, OSC, (RMD), SFS, UBC, WSP
Refs: 9

*Helvella acetabulum* (L. ex St.-Amans) Quél.
Distr: ALB., AZ, B.C., CA, CO, ID, OR, UT, WA
Herb: CUP, NY, OSC, (RMD), S, SFS, WSP, WTU, UVIC
Refs: 10, 61

*Helvella albella* Quél.
Distr: AK, CO
Herb: MICH, (W-K)
Refs: 19, 61

*Helvella albipes* Fuckel
Distr: ID
Herb: NY
Refs: 56

*Helvella atra* Holmskjold
Distr: AK, MT, NM, WA
Herb: NY, WTU, (W-K)
Refs: 10, 19

**Helvella brevissima* Peck
Distr: CA
Herb: CUP, NY
Refs: 56

*Helvella connivens* Dissing & Lange
Distr: OR, WA
Herb: OSC
Refs: 10

*Helvella corium* (Weberbauer) Massee
Distr: AK, ALB., AZ, B.C., CO, ID, OR, WA
Herb: NY, OSC, (RMD), SFS, UBC, WSP, WTU, (W-K)
Refs: 10, 19, 61

**Helvella costifera* Nannf.
Distr: AK, CA
Herb: SFS, (W-K)
Refs: 10, 19

*Helvella crispa* Scop. ex Fr.
Distr: AK, ALB., AZ, B.C., CA, CO, ID, NM, OR, UT, WA
Herb: CUP, K, NY, OSC, SFS, UBC, WTU, WSP, (W-K)
Refs: 10, 19, 61
*Helvella cupuliformis* Dissing & Nannf.
Distr: AK, NM
Herb: OSC, (W-K)
Refs: 10, 19
*Helvella elastica* Bull. ex St.-Amans
Distr: AK, ALB., B.C., CA, CO, ID, NM, OR, UT, WA, WY
Herb: CUP, NY, OSC, (RMD), SFS, UBC, WSP, WTU, (W-K)
Refs: 10, 19, 61
*Helvella ephippium* Lév.
Distr: ALB., AZ, CA
Herb: BPI, OSC, (RMD)
Refs: 10, 61
*Helvella fusca* Gill. sensu Bres.
Distr: AK, OR
Herb: OSC, (W-K)
Refs: 10, 19
*Helvella lacunosa* Afz. ex Fr.
Distr: AK, AZ, B.C., CA, CO, ID, NM, OR, UT, WA
Herb: BPI, CUP, K, NY, OSC, SFS, WSP, WTU, (W-K)
Refs: 9, 10, 19, 61
*Helvella leucomelaena* (Pers.) Nannf. in Lundell & Nannf.
Distr: AK, ALB., CA, CO, ID, OR, UT, WA
Herb: NY, OSC, (RMD), SFS, WSP, WTU, (W-K)
Refs: 10, 19, 61
*Helvella leucopus* Pers.
Distr: CA, ID, OR
Herb: CUP, L, NY, OSC, WSP
Refs: 10
*Helvella macropus* (Pers. ex Fr.) Karst.
Distr: AK, AZ, B.C., CO, ID, OR
Herb: BPI, NY, UBC, WSP, WTU, (W-K)
Refs: 10, 19, 61
*Helvella maculata* Weber
Distr: ALB.
Herb: (RMD)
Refs: 61
*Helvella pezizoides* Afz. ex Fr.
Distr: CA, CO, NM, OR
Herb: OSC
Refs: 10, 61
*Helvella philonotis* Dissing
Distr: OR
Herb: OSC
Refs: 10
*Helvella queletii* Bres.
Distr: AK, ALB., B.C., CA, CO, ID, OR, WA, WY
Herb: CUP, OSC, (RMD), S, WSP, (W-K)
Refs: 10, 19, 61
*Helvella solitaria* (Karst.) Karst.
Distr: AK, UT
Herb: OSC, (W-K)
Refs: 10, 19

*Helvella stevensii* Peck
Distr: OR
Herb: OSC
Refs: 10, 61
*Helvella villosa* (Hedwig ex Kuntze) Dissing
Distr: AK, ALB., CA, ID, OR
Herb: OSC, (RMD), (W-K)
Refs: 10, 54, 61
*Rhizina undulata* Fr.
Distr: B.C., CA, ID, MT, OR, WA
Herb: CUP, NY, OSC, SFS, UBC, WSP, WTU
Refs: 9, 56
*Wynnella silvicola* (Beck ex Sacc.) Nannf.
=*O. auricula* (Schaeffer ex Cooke) Rehm
Distr: AK, ALB., B.C., CO, ID, WA
Herb: NY, OSC, (RMD), SFS, UVIC, WSP
Refs: 16, 56

Family PYRONEMATACEAE

*Aleuria aphanodictyon* Kobayasi
Distr: AK
Herb: BPI
Refs: 27
*Aleuria aurantia* (Pers. ex Hook.) Fuckel
Distr: AZ, B.C., CA, ID, OR, WA
Herb: CUP, NY, OSC, SFS, WSP, WTU
Refs: 9, 56
*Aleuria rhenana* Fuckel
Distr: CA, WA
Herb: NY, OSC, SFS
Refs: 56
*Anthracobia macrocystis* (Cooke) Boud.
Distr: B.C., CA, ID, OR
Herb: OSC, WSP
Refs: 9, 35, 55
*Anthracobia melaloma* (Alb. & Schw. ex Fr.) Boud.
Distr: B.C., CA, CO, ID, OR, WA
Herb: BPI, NY, OSC, WSP, WTU
Refs: 9, 35, 55
*Anthracobia muelleri* (Berk.) Rifai
Distr: UT
Herb: CUP, OSC
Refs: 35, 55
*Anthracobia nitida* Boud.
Distr: ALB., WA
Herb: OSC, (RMD), UPS
Refs: 35
*Byssonectria aggregata* (Berk. & Br.) Rogerson & Korf
Distr: ALB.
Herb: OSC, (RMD)
Refs: 11
**Byssonectria tetraspora* (Fuckel) Korf
Distr: AK
Herb: BPI
Refs: 27, 30

Caloscypha fulgens (Pers.) Boud.
Distr: ALB., B.C., CA, CO, ID, MT, OR, UT, WA, WY
Herb: CUP, NY, OSC, (RMD), SFS, UBC, WSP, WTU
Refs: 56

Cheilymenia coprinaria (Cooke) Boud.
Distr: B.C., CA, CO, ID, OR, UT, WA
Herb: NY, OSC, SFS, UBC, WSP, WTU
Refs: 8, 9, 56

Cheilymenia crucipila (Cooke & Phillips) LeGal
Distr: ID, WA
Herb: NY, WSP
Refs: 8, 9

*Cheilymenia pulcherrima (Crouan) Boud.
Distr: AZ, CA, WA
Herb: BPI, NY, WSP, WTU
Refs: 56

*Cheilymenia raripila (Phillips) Seaver
Distr: CA
Herb: CUP, NY
Refs: 56

Cheilymenia stercorea (Pers. ex Fr.) Boud.
Distr: B.C., CA, CO, ID, OR, NV, WA
Herb: BPI, CUP, NY, OSC, UBC, WSP, WTU
Refs: 8, 56

Cheilymenia theloboloides (Fr.) Boud.
Distr: ALB., CA, CO, ID, OR, WA, WY
Herb: BPI, NY, OSC, (RMD), WSP
Refs: 8, 9, 56

Coprobia granulata (Fr.) Boud.
Distr: CA, ID, OR, WA
Herb: OSC, SFS, WSP, WTU
Refs: 9

Coprotus aurora (Crouan & H. Crouan) Kimbr., Luck-Allen & Cain
Distr: ALB., WY
Herb: TRTC
Refs: 26

Coprotus breviascus (Velen.) Kimbr., Luck-Allen & Cain
Distr: WY
Herb: TRTC
Refs: 26

Coprotus dextrinoideus Kimbr., Luck-Allen & Cain
Distr: WY
Herb: TRTC
Refs: 26

Coprotus glaucellus (Rehm) Kimbr.
Distr: B.C., CO
Herb: OSC, TRTC
Refs: 26

Coprotus granuliformis (Crouan & H. Crouan) Kimbr.
Distr: CO, OR, WY
Herb: NY, OSC, TRTC
Refs: 26, 56

Coprotus leucopocillum Kimbr., Luck-Allen & Cain
Distr: CA, WY
Herb: OSC, TRTC
Refs: 26

_Coprotus luteus_ Kimbr., Luck-Allen & Cain
Distr: MT, WY
Herb: TRTC
Refs: 26
_Coprotus ochraceus_ (Crouan & H. Crouan) Kimbr.
Distr: CA, ID, OR
Herb: MICH, NY, WSP
Refs: 26
_Coprotus sexdecimsporus_ (Crouan & H. Crouan) Kimbr.
Distr: CA, CO, WY
Herb: NY, TRTC
Refs: 24, 26, 56
_Coprotus winteri_ (March.) Kimbr.
Distr: CO
Herb: NY
Refs: 26
_Fimaria cervina_ (Phillips) van Brumm.
Distr: OR
Herb: OSC
Refs: 2
*_Fimaria hepatica_ (Batsch ex Fr.) van Brumm.
Distr: CO, OR
Herb: BPI, NY
Refs: 2, 9
*_Fimaria porcina_ Svrček & Kubička
Distr: AK
Herb: BPI
Refs: 27
*_Geopora clausa_ (Tul. & Tul.) Burdsall
Distr: ALB.
Herb: (RMD)
Refs: 4
_Geopora cooperi_ Harkn.
Distr: AK, ALB., CA, CO, ID, OR, TU, WA
Herb: OSC, (RMD), VPI
Refs: 4
_Geopyxis carbonaria_ (Alb. & Schw. ex Pers.) Sacc.
Distr: ALB., B.C., CA, CO, ID, MT, OR, UT, WA
Herb: CUP, OSC, (RMD), WSP, WTU
Refs: 9, 55, 56
_Geopyxis majalis_ (Fr.) Sacc.
Distr: CA, OR
Herb: BPI, OSC, WSP
Refs: 55
_Geopyxis vulcanalis_ (Peck) Sacc.
Distr: ALB., B.C., CA, CO, ID, OR, UT, WA, WY
Herb: BPI, CUP, NY, OSC, (RMD), SFS, UBC, WSP, WTU
Refs: 56
_Humaria hemisphaerica_ (Wigg. ex Fr.) Fuckel
Distr: AK, ALB., B.C., CA, ID, WA
Herb: OSC, (RMD), SFS, UBC, WSP, WTU
Refs: 9
_Lamprospora crec'hqueraultii_ (Crouan) Boud.
Distr: CO, ID, OR
Herb: NY, OSC, WSP
Refs: 9, 56

- *_Lamprospora crouani_ (Cooke) Seaver
  - Distr: CO, WA
  - Herb: NY, WTU
  - Refs: 9, 56
- *_Lamprospora polytrichina_ (Rehm) Seaver
  - Distr: CO, WA
  - Herb: NY, WTU
  - Refs: 56
- *_Lamprospora spinulosa_ Seaver
  - Distr: ID, OR
  - Herb: NY, WSP
  - Refs: 56
- _Lasiobolus ciliatus_ (Fr.) Boud.
  - Distr: AK, CA, CO, ID, OR, UT, WA
  - Herb: CUP, NY, OSC, SFS, WSP, WTU
  - Refs: 9, 27
- _Lasiobolus macrotrichus_ Rea
  - Distr: OR
  - Herb: OSC
  - Refs: 9
- *_Lasiobolus ruber_ (Quel.) Sacc.
  - Distr: CO, OR
  - Herb: NY, OSC
  - Refs: 9, 56
- _Leucoscypha hetieri_ (Boud.) Rifai
  - Distr: B.C.
  - Herb: OSC
  - Refs: 55
- _Leucoscypha rutilans_ (Fr.) Dennis & Rifai
  - Distr: CA, CO, WA
  - Herb: CUP, NY, OSC, SFS
  - Refs: 9, 55, 56
- _Melastiza chateri_ (W. G. Smith) Boud.
  - Distr: ALB., B.C., CO, ID, OR, WA
  - Herb: NY, OSC, (RMD), WSP, WTU
  - Refs: 9, 56
- _Melastiza rubra_ (Batra) Maas G.
  - Distr: AZ
  - Herb: OSC
  - Refs: 1, 7
- _Miladina lechithina_ (Cooke) Svrček
  - Distr: ID, OR, UT
  - Herb: OSC
  - Refs: 53
- _Mycoarctium ciliatum_ Jain & Cain
  - Distr: CA, CO
  - Herb: TRTC
  - Refs: 33
- _Octospora leucoloma_ Gray
  - Distr: AK, CA, CO, ID, OR
  - Herb: BPI, NY, OSC, UBC, WSP
  - Refs: 9, 27, 55
- *_Octospora rubens_ (Boud.) Moser
  - Distr: CO, WA
  - Herb: BPI, NY, WSP
  - Refs: 44

*Otidea abietina (Pers. ex Fr.) Fuckel
Distr: AK, CO, OR, WA
Herb: BPI, NY, OSC, WTU, (W-K)
Refs: 16, 37, 45, 62

Otidea alutacea (Pers.) Massee
Distr: ALB., CA, ID, WA
Herb: MICH, OSC, (RMD), SFS, WSP
Refs: 9, 16

*Otidea bufonia (Pers.) Boud.
Distr: CA, WA
Herb: WTU
Refs: 9

Otidea concinna (Pers.) Sacc.
Distr: CA, ID, WA
Herb: BPI, MICH, OSC, SFS, WSP, WTU
Refs: 9, 16

*Otidea grandis (Pers.) Rehm
Distr: ID, WA
Herb: BPI, MICH, NY, WSP
Refs: 16, 56

Otidea leporina (Batsch) S. F. Gray
Distr: ALB., AZ, B.C., CA, CO, ID, OR, WA, WY
Herb: CUP, MICH, NY, OSC, SFS, UBC, WSP, WTU
Refs: 16, 56

Otidea onotica (Pers.) Fuckel
Distr: CA, CO, ID, OR, WA
Herb: CUP, MICH, OSC, SFS, WSP, WTU
Refs: 9, 16

Otidea smithii Kanouse
Distr: B.C., CA, ID, WA
Herb: MICH, OSC, WSP
Refs: 16

Pseudocollema cartilagineum Kanouse & Smith
Distr: ALB., CO, MT, WA
Herb: MICH, OSC, (RMD), WSP
Refs: 18

*Psilopezia nummularia Berk.
Distr: ID, WA
Herb: BPI, WSP
Refs: 9, 49, 50, 56

Pulparia persoonia (Crouan) Korf, Pfister & Rogers
Distr: AK
Herb: WSP
Refs: 9, 30

Pulparia plachonis (Dun.) Korf, Pfister & Rogers
Distr: WA
Herb: WSP
Refs: 30, 55, 56

Pulvinula archeri (Berk. in Hook.) Rifai
Distr: B.C., ID, OR, WA
Herb: BPI, NY, OSC, WSP
Refs: 52, 55

Pulvinula carbonaria (Fuckel) Boud.
Distr: CA, MT, OR
Herb: BPI, NY, OSC
Refs: 52, 55

*Pulvinula convexula* (Karst.) Pfister
=*P. constellatio* (Berk. & Br.) Rehm
Distr: AK, CO, MT, OR, CA
Herb: BPI, CUP, NY, OSC, WSP
Refs: 9, 52, 55

*Pulvinula globifera* (Berk. & Curt.) LeGal
Distr: AZ
Herb: OSC
Refs: 52

*Pulvinula laeterubra* (Rehm) Pfister
Distr: ALB., B.C.
Herb: OSC
Refs: 52

*Pyronema omphalodes* (Bull. ex St.-Amans) Fuckel
Distr: ALB., B.C., CA, ID, UT, WA
Herb: OSC, (RMD), UBC, WSP, WTU
Refs: 9, 43, 56

*Scutellinia erinaceus* (Schw.) Kuntze
Distr: ID, UT
Herb: OSC, WSP
Refs: 6

*Scutellinia scutellata* (L. ex Fr.) Lambotte
Distr: AK, ALB., B.C., CA, CO, ID, NM, OR, WA
Herb: CUP, NY, OSC, (RMD), SFS, UBC, WSP, WTU
Refs: 6, 9, 55, 56

**Scutellinia setosa* (Nees) Seaver
Distr: B.C., CO, WA
Herb: CUP, NY, UBC, WSP
Refs: 56

**Scutellinia trechispora* (Berk. & Br.) Lambotte
Distr: AK, CO
Herb: BPI, NY
Refs: 6, 27, 56

*Scutellinia umbrarum* (Fr.) Lambotte
Distr: AK, AZ, B.C., CA, CO, ID, NM, WA
Herb: NY, OSC, UBC, WSP, WTU
Refs: 6, 56

*Scutellinia verrucipolaris* Denison
Distr: WA
Herb: WSP
Refs: 6

*Sepultaria arenicola* (Lév.) Massee
Distr: CO
Herb: WSP
Refs: 9, 56

*Sepultaria arenosa* (Fuckel) Boud.
Distr: CO, OR
Herb: NY, OSC
Refs: 9, 56

**Sepultaria longii* Seaver
Distr: WA
Herb: WTU
Refs: 56

*Sepultaria pellita (Cooke & Peck) Seaver
Distr: AK
Herb: (W-K)
Refs: 56, 62

*Sepultaria semiimmersa (Karst.) Massee
Distr: CA, OR, WA
Herb: BPI, NY, OSC, WSP
Refs: 56

*Sepultaria sepulta (Fr.) Boud.
Distr: CA, CO
Herb: CUP
Refs: 4, 56

*Tarzetta bronca (Peck) Korf & Rogers
Distr: CO
Herb: NY
Refs: 56

Tarzetta catinus (Pers.) Korf & Rogers
Distr: CA, CO, OR, WA
Herb: OSC, SFS, WTU
Refs: 9, 30

Tarzetta cupularis (L. ex Fr.) Lambotte
Distr: B.C., CA, CO, ID, OR, WA
Herb: BPI, CUP, NY, OSC, SFS, UBC, WSP, WTU
Refs: 9, 56

*Thelebolus crustaceus (Fuckel) Kimbr.
Distr: AK
Herb: BPI
Refs: 27

*Thelebolus microsporus (Berk. & Br.) Kimbr.
Distr: AK, CO
Herb: BPI, NY
Refs: 27

*Thelebolus stercorius (Pers.) Fr.
Distr: B.C., CA, WY
Herb: CUP
Refs: 22

Tricharina gilva (Boud. in Cooke) Eckblad
Distr: ID, OR
Herb: OSC, WTU
Refs: 11, 56

Trichobolus octosporus Krug
Distr: WY
Herb: BPI, TRTC
Refs: 32

Trichobolus zukalii (Hermerl) Kimbr. & Korf
Distr: B.C.
Herb: CUP
Refs: 22, 24

Trichophaea abundans (Karst.) Boud.
Distr: CA, CO, ID, OR
Herb: BPI, CUP, OSC, SFS
Refs: 17

*Trichophaea boudierii Grelet
Distr: ID
Herb: WSP
Refs: 13

*Trichophaea brunnea* (Alb. & Schw. ex Fr.) Batra & Batra
Distr: ALB.
Herb: OSC
Refs: 9, 55, 56

**Trichophaea bullata* Kanouse
Distr: CO, OR, WA, WY
Herb: BPI, NY, OSC, WTU
Refs: 17

**Trichophaea gregaria* (Rehm) Boud.
Distr: CO, OR, WY
Herb: BPI, MICH
Refs: 17

*Trichophaea hemisphaerioides* (Mont.) Graddon
Distr: OR
Herb: OSC
Refs: 9

*Trichophaea woolhopiea* (Cooke & Phillips) Boud.
Distr: CO
Herb: OSC
Refs: 9

## QUESTIONABLE RECORDS

### Family SARCOSOMATACEAE

*Plectania rimosa* Peck
*Sarcosoma globosa* Caspary
*Urnula craterium* (Schw.) Fr.

### Family ASCOBOLACEAE

*Boudiera marginata* Phillips & Harkn.
*Saccobolus obscurus* (Cooke) Phillips

### Family PEZIZACEAE

*Peziza atrovinosa* Cooke
*Peziza chlorophysa* Sacc.
*Peziza convoluta* Peck
*Peziza rubricosa* Fr.
*Peziza secreta* Phillips

### Family MORCHELLACEAE

*Morchella smithii* Cooke

### Family HELVELLACEAE

*Gyromitra brunnea* L. ex Underwood
*Helvella oregonensis* Ellis & Everh.

### Family PYRONEMATACEAE

*Cubonia bulbifera* Hotson
*Humaria macrospora* (Wallr.) Fuckel
*Humaria saccardoi* Cavara
*Humaria turbinata* Snyder
*Humarina axillaris* (Nees) Seaver
*Humarina coccinea* (Crouan) Seaver

## QUESTIONABLE RECORDS: PYRONEMATACEAE (Cont'd.)

- *Humarina orthotricha* (Cooke & Ellis) Seaver
- *Humarina purpurea* Seaver
- *Lasiobolus pilosus* (Fr.) Sacc.
- *Neotiopezis sclerothrix* Clem.
- *Patella irregularis* (Clem.) Seaver
- *Patella piliseta* (Clem.) Seaver
- *Patella sequoiae* (Phillips) Seaver
- *Ryparobius pachyascus* Zukal
- *Scutellinia chaetoloma* Clem.

## ADDITIONAL SPECIES WITH UNSATISFACTORY NAMES

*Pachyella*-affinities

- "*Peziza*" *melaleucoides* Seaver
  - Distr: B.C., ID, OR, WA
  - Herb: OSC, UVIC, WSP
  - Refs: 56
- "*Paxina*" *recurva* Snyder
  - Distr: B.C., ID, MT, WA
  - Herb: CUP, NY, OSC, SFS, UVIC, WSP, WTU
  - Refs: 56, 59

*Helvella*-affinities

- "*Paxina*" *compressa* Snyder
  - Distr: CA, OR, WA
  - Herb: NY, OSC, SFS, WTU
  - Refs: 56, 59

*Leucoscypha*-affinities

- "*Patella*" *maculosa* (Phillips) Seaver
  - Distr: CA
  - Herb: CUP
  - Refs: 54, 56
- "*Humarina*" *ochroleuca* (Clem.) Seaver
  - Distr: CO, OR
  - Herb: NY, OSC
  - Refs: 56

*Tarzetta*-affinities

- "*Pustularia*" *rosea* Rea
  - Distr: B.C.
  - Herb: OSC
  - Refs: 9

*Trichophaea*-affinities

- "*Patella*" *contradicta* Seaver
  - Distr: B.C.
  - Herb: OSC
  - Refs: 57
- "*Sphaerospora*" *hinnulea* (Berk. & Br.) Massee
  - Distr: CA, OR, WA
  - Herb: BPI, WSP
  - Refs: 9, 55, 56

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# A NEW SPECIES OF MICROASCUS AND ITS PECULIAR CONIDIAL STATE

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During a taxonomical study of soil fungi in Thailand, a new ascomycete belonging to the genus Microascus was encountered. The conidial state of this species is characterized by short annellophores and dark, globose, thick-walled, catenate conidia with a germ slit, suggestive of the genus Wardomyces, from which it differs in several significant characteristics. It cannot be accommodated in any known genus, and is, besides the ascosporic state, described here as new genus.

Microascus inopinatus Udagawa & Furuya, sp.nov. (Figs. 1, 2)

Status conidialis: Wardomycopsis inopinata Udagawa & Furuya, st.nov. (vide infra)

Coloniae in agaro farina avenae mixto vel agaro cum decocto tuberorum et carota restrictae, tenues et partim submersae, plus minusve floccosae; fructificationes conidiorum abunde efferentes, atrocinereae vel fere nigrae; ascocarpae tarde effectae; reversum valde brunneo-cinereum.

Ascocarpae dispersae vel irregulariter aggregatae, superficiales vel partim immersae, nigrae, opacae, subglobosae, 160-350 μm diam, pilosae, postea longirostrae, ostiolatae; rostra atra, cylindracea, 550-1,000 μm longa, ad basim 18-25(-28) μm diam, pilosa, saepe distorta; peridium 20-40 μm crassum, valde olivaceo-brunneum, membranacem vel carbonaceum, e usque 8 stratis cellularum composito. Pili ascocarparum (et collorum) numerosi, recti vel flexuosi, septati, laeves, olivaceo-brunnei, usque 130-250 μm longi, prope basin 3.0-3.5 μm diam, in fasciculis saepe dispositi. Asci octospori, globosi vel ovoidei, 6-9 × 5-7 μm, tenues, nonstipitati, irregulariter dispositi, evanescentes. Ascosporae primum dextrinoideae, hyalinae vel dilute stramineae, triangulares vel reniformes, 3.0-3.5 × 2.5-3.0 μm, laeves, poro germinationis basilari praeditae. Status conidialis Wardomycopsis.

Typus No. 2767, NHL, isolatus e solo in thailandensis.

Etym. Refers to the unexpected morphology of the conidial structures.

Colonies on oat-meal agar or potato-carrot agar growing restrictedly, thin, vegetative mycelium submerged, with more or less floccose surface; conidial structures abundantly produced, dark grey to nearly black (Leaden Grey to Black; Rayner, 1970); ascocarps later developed within aerial growth or into the agar; reverse dark brownish grey.

Ascocarps scattered or irregularly aggregated, superficial to semi-immersed, black, opaque, subglobose, 160-350 µm in diam, later with a long neck, hairy, ostiolate; necks dark-colored, cylindrical, 550-1,000 × 18-25(-28) µm, hairy, often distorted; peridium 20-40 µm thick, dark olivaceous brown, membranaceous to carbonaceous, up to 8 cells deep in radial section, consisting of outer layers of thick-walled angular dark cells and inner layer of hyaline cells. Ascocarp hairs numerous, straight to flexuous, septate, smooth-walled, olivaceous brown, up to 130-250 µm long, 3.0-3.5 µm wide near the base, often adhering in fascicles, covering the exposed upper part of the ascocarp and the neck. Asci 8-spored, globose to ovoid, 6-9 × 5-7 µm, thin-walled, non-stipitate, irregularly disposed, evanescent. Ascospores dextrinoid when young, hyaline to pale straw-colored, pale reddish brown in mass, triangular to reniform, 3.0-3.5 × 2.5-3.0 µm, smooth-walled, with an indistinct germ pore at base. Conidial state present, Wardomycopsis.

Holotype - No. 2767, NHL, isolated from soil, Bangkhen near Bangkok, Thailand, February 25, 1974. Isotype - SANK 10777.

Wardomycopsis inopinata Udagawa & Furuya, gen. et sp. nov. (Figs. 1, 2)

Deuteromycotina, hyphomycetes. Coloniae restrictae, fuscae. Mycelium sparsum, partim superficiale, partim in substrato immersum, hyalinum vel dilute flavo-brunneum, ex hyphis vulgo flexuosis, ramosis, septatis, laevibus, 1.5-3.0 µm diam, saepe funiculosis compositum. Structurae conidicae simplices, annellophoris solitaris vel catervis annellophororum parvis acrogenis in conidiophoris brevibus. Conidiophora semi-macronemata, mononemata, septata, laevia, hyalina vel subhyalina, raro ramosa, 3.5-6.0(-12.0) × 2.0-3.0(-4.0) µm. Cellulae conidiogenae monoblasticae, in conidiophoris incorporatae, terminales, sed interdum discretae, percurrentes, hyalinae vel leviter coloratae, simplices vel septatae, laeves, ampulliformes vel cylindricae, 3.5-5.0 × 2.5-3.0 µm, saepe superne inflatae, cum annellationibus terminalibus distinctis. Conidia sicca, acrogena, basipetalia et breve catenulata, simplicia, primum pallida et pyriformia, deinde olivaceo-brunnea, in massa nigra, globosa vel subglobosa, 4.0-5.5 µm diam, parietibus crassis, laeves, cum fissura mediana (plerumque transversali).

Typus No. 2767, NHL, cum forma ascosporae (loc. cit.).

Etym. of generic name. Refers to position intermediate between Scopulariopsis and Wardomyces.

Colonies restricted, dark-colored. Mycelium sparse, superficial or immersed, hyaline to pale yellowish brown, composed of mostly flexuous, branched, septate, smooth-walled hyphae, 1.5-3.0 µm in diam, often forming funicles.

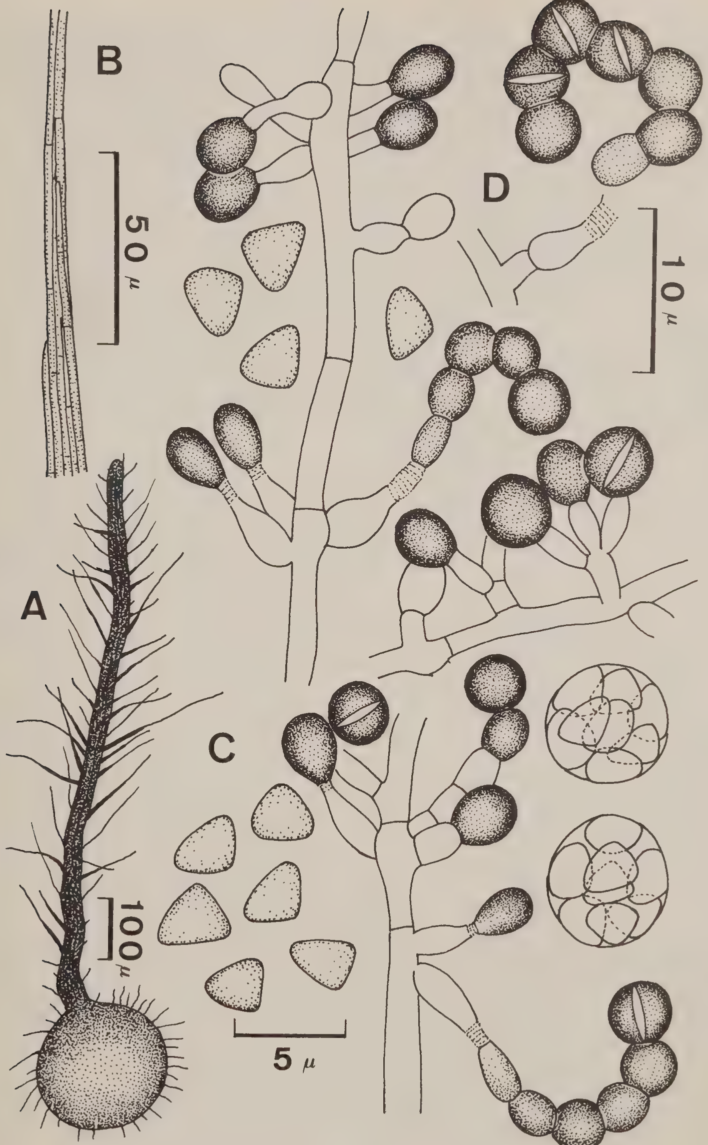
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Fig. 1. Microascus inopinatus Udagawa & Furuya. A. Ascocarp. B. A portion of ascocarp hairs. C. Asci and ascospores. D. Conidial structures of Wardomycopsis state.

Conidial structures as annellophore borne singly along the aerial or prostrate hyphae, or in small divergent groups on short conidiophores. Conidiophores semi-macronematous, mononematous, septate, smooth-walled, hyaline to subhyaline, rarely branched, 3.5-6.0(-12.0) × 2.0-3.0(-4.0) µm. Conidiogenous cells monoblastic, integrated, terminal but sometimes separated, percurrent, hyaline to slightly colored, simple or septate, smooth-walled, flask-shaped to cylindrical, 3.5-5.0 × 2.5-3.0 µm, often swollen above, with distinct terminal annellations. Conidia dry, acrogenous, borne in basipetal succession as a curved short chain, 1-celled, pale-colored and pyriform when young, then becoming olivaceous brown, black in mass, globose to subglobose, 4.0-5.5 µm in diam, with walls thick and smooth, with a median germ slit running the entire length of one side (mostly transverse).

Holotype - No. 2767, NHL, with the ascosporic state (loc. cit.). Isotype - SANK 10777.

Specimens cited are deposited as follows: No. 2767 (holotype) in the Mycological Herbarium, National Institute of Hygienic Sciences (NHL), Tokyo, Japan, and No. 10777 (isotype) in the Mycological Herbarium, Fermentation Research Laboratories, Sankyo Co., Ltd. (SANK), Tokyo, Japan.

Upon most substrata containing vegetable extracts such as PDA, PCA or oat-meal agar, the ascocarps are produced fairly abundantly and ripen within about 1 month, and are usually cleistocarpic. Plate cultures are often not in good condition to show the ostiolate characteristic of the ascocarp. The long-beaked neck of the ascocarps is very slow to form and is ultimately seen on the agar slants after 18 months incubation. The development was so slow that it was difficult to establish the proper placement of the new species in the Microascaceae. When young the ascocarps are rather suggestive of *Kernia* (Malloch and Cain, 1971), but as these develop they assume a clearly different.

This species is somewhat similar to *M. giganteus* Malloch (1970) which is, among previous members of the genus, also unique in possessing a *Wardomyces* conidial state. Both species produce long-beaked setose ascocarps. However the present species has smaller perithecia, smaller and triangular ascospores, and globose conidia that are in chains.

The triangular pattern of the ascospores in *M. inopinatus* is strongly reminiscent of those seen in some species of the genus, viz. *M. trigonosporus* Emmons & B.O. Dodge and *M. pyramidus* Barron & Gilman (Arx, 1975; Barron *et al.*, 1961; Morton and Smith, 1963; Udagawa, 1962). The new species is easily distinguished from these similar species in the above mentioned appearance of the ascocarps, as well as in association with a conidial state of the '*Wardomycopsis*' type.

The *Wardomycopsis* state in this species is very characteristic. Although this state could not be identified

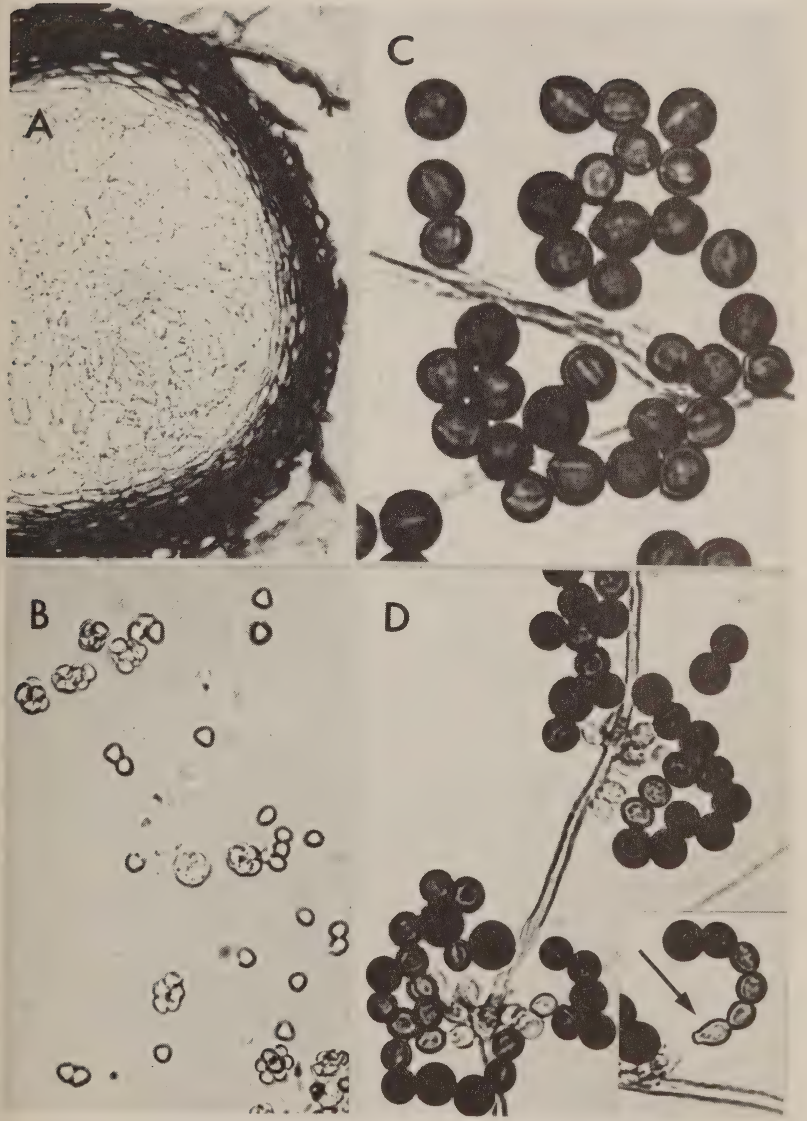

Fig. 2. M. inopinatus. A. Section of ascocarp. ×400. B. Asci and ascospores. ×750. C. Conidia. ×2,000. D. Conidial structures (arrow: pyriform, young conidium). ×1,500.

with any described genus, the ontogeny of conidial formation may be analogous to that in *Scopulariopsis* (Morton and Smith, 1963). Of particular resemblances are the production of annellophores and pyriform conidia with a truncate base (when young). *Wardomycopsis* belongs in the complex of several imperfect genera connected with the Microascaceae (Malloch, 1970) and occupies a position intermediate between *Scopulariopsis* and *Wardomyces*. It differs from the former in the globose, thick-walled conidia with a germ slit (when matured) and the latter in annellated conidiogenous cells and catenate, globose conidia.

There are at least two *Scopulariopsis* species to be transfered to the new genus: *Wardomycopsis humicola* (Barron) Udagawa & Furuya comb.nov. (Syn. *Scopulariopsis humicola* Barron, Antonie van Leeuwenhoek 32: 294. 1966) and *Wardomycopsis* state (= *Scopulariopsis* state) of *Microascus singularis* (Sacc.) Malloch & Cain. A comparison of our organism with the type collection of *S. humicola* Barron (CBS 487.66 = ATCC 16691) showed them to be distinct from each other because of the difference in shape of conidia. The conidia of the additional two species are normally long-ovate to short-cylindric or elliptical-ovate. *M. singularis* also differs from this fungus in having nearly glabrous ascocarps and larger, heart-shaped ascospores (Barron *et al.*, 1961; Malloch and Cain, 1971).

## ACKNOWLEDGMENTS

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# TYPE STUDIES IN THE GENUS PEZIZA. II. OPERCULATE DISCOMYCETES DESCRIBED BY J. B. ELLIS AND CO-AUTHORS

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In my continuing study of the genus *Peziza* I have examined the species described by J. B. Ellis and his co-authors. My task was facilitated by the use of *A Record of the Fungi Named by J. B. Ellis* by Edith Cash (1953). Species of *Peziza* referred to genera of inoperculate Discomycetes by Cash are listed at the end of this article. More detailed comments on the operculate Discomycetes follow. Type specimens from the New York Botanical Garden have been examined where there have been no recently published comments.

*Peziza aurantiopsis* Ell., Bull. Torrey Bot. Club *9*: 18. 1882.

≡ *Lachnea aurantiopsis* (Ell.) Sacc., Syll. Fung. *8*: 180. 1889.

≡ *Wolfina aurantiopsis* (Ell.) Seav., Mycologia *29*: 680. 1937.

This is the type species of *Wolfina* Seav. ex Eckblad. Eckblad (1968) provides an accurate description of this species. The genus is placed in the Sarcosomataceae of the Sarcoscyphineae by Korf (1972).

*Peziza brachypus* Ell. & Ev., J. Mycol. *4*: 55. 1888.

≡ *Geopyxis brachypus* (Ell. & Ev.) Sacc., Syll. Fung. *8*: 68. 1889.

The fungus should be referred to *Helvella* section *Macropodes*. Seaver (1928) treated the species as a synonym of *Paxina subclavipes* (Phill. & Ell.) Seaver.

*Peziza cestrica* Ell. & Ev., J. Mycol. *7*: 152. 1885.

≡ *Humaria cestrica* (Ell. & Ev.) Sacc., Syll. Fung. *8*: 133. 1889.

≡ *Aleuria cestrica* (Ell. & Ev.) Seav., North American cup-fungi (operculates) p. 28. 1928

The species is properly referred to *Aleuria* as was done by Seaver.

*Peziza chlamydospora* Ell. & Ev., Bull. Torrey Bot. Club *10*: 98. 1883.

Authenic material in the Farlow Herbarium general collection from the type locality, and the type collection (NY!), show this to be close to, if not identical with, *Peziza atrovinosa* Cooke. Seaver (1928) first listed this synonymy.

*Peziza hainesii* Ell., Bull. Torrey Bot. Club *8*: 65. 1881; North American Fungi no. 562.

≡ *Lachnea hainesii* (Ell.) Sacc., Syll. Fung. *8*: 186. 1889.

Seaver (1928) treated this as a synonym of *Paxina semitosta* (Berk. & Curt.) Seaver. Korf (1960) treated it as a synonym of *Jafnea semitosta* (Berk. & Curt.) Korf. My study of number 562 in *North American Fungi* (FH) bears out this opinion.

*Peziza olivatra* Ell. & Holw. in Arth. et al., Bull. Minnesota Geol. and Nat. Hist. Surv. *3*: 36. 1887.

≡ *Humaria olivatra* (Ell. & Holw.) Sacc., Syll. Fung. *8*: 148. 1889.

Seaver (1928) reported this as an inoperculate Discomycete. The species seems best referred to the Dermateaceae because of its dark ectal excipulum. The holotype (NY) has been studied.

*Peziza orthotricha* Cke. & Ell. Grevillea *6*: 7. 1877.

≡ *Humaria orthotricha* (Cke. & Ell.) Sacc., Syll. Fung. *8*: 119. 1889.

≡ *Humarina orthotricha* (Cke. & Ell.) Seav., North American cup-fungi (operculates) p. 127. 1928.

This fungus has large operculate asci, globose or subglobose warted ascospres, and occurs on a moss. It appears to develop cleistohymenially. It is a member of the genus *Octospora* and should be compared with *O. meslinii* (Le Gal) Svrček & Kubička which occurs on the same moss (Benkert 1976).

*Peziza rhizomorphae* Ell. & Ev., J. Mycol. *4*: 98. 1888.

≡ *Plectania rhizomorphae* (Ell. & Ev.) Sacc., Syll. Fung. *8*: 164. 1889.

≡ *Scutellinia rhizomorphae* (Ell. & Ev.) Kuntze, Rev. Gen. Pl. *3*: 520. 1898.

This species, based on the specimens in NY, is *Plectania melastoma* (Sow. ex Fr.) Fuckel. This accords with Seaver's (1928) synonymy.

*Peziza scutelloides* Ell., Bull. Torrey Bot. Club *9*: 18. 1882; North American Fungi no. 838.
≡ *Sphaerospora scutelloides* (Ell.) Sacc., Syll. Fung. *8*: 188. 1889.
Rifai (1968) suggested that this species is one of the synonyms of *Sphaerosporella hinnulea* (Berk. & Br.) Rifai. Certainly the description given by Ellis closely matches the concept Rifai presents. Ellis's specimen has a bright orange hymenium and occurs on soil. These features distinguish it from *S. brunnea*. There is confusion on several points over the distinction between *Sphaerosporella* and *Pyronemella*. Tewari and Pant (1968) would use the name *Pyronemella* for hairy spherical-spored Discomycetes on burned areas. This is essentially the cirumscription of *Sphaerosporella*. A study of *P. arenosa* Speg., type species of the genus *Pyronemella*, might resolve the problem. Korf (1972) treated *Sphaerosporella* as a synonym of *Trichophaea*.

*Peziza stephensoniana* Ell. in Rehm, Ascom. Lojk. p.3. 1882. Invalid, published in synonymy.
≡ *Discina repanda* (Wahl. ex Fr.) Sacc. subsp. *stephensoniana* Ell. in Rehm ex Sacc., Syll. Fung. *8*: 100. 1889.
Pfister (1973) gave a complete synonymy and indicated that the species was indistinguishable from *Peziza repanda*. As for Ellis's opinion on the taxon, it is apparent from studying specimens identified by him that he had no clear concept of it. Among those collections in the Farlow Herbarium identified by Ellis are specimens of *Peziza badioconfusa* Korf, *P. sylvestris* Boud., *P. ampliata* Pers. ex Fr., and an *Otidea*.

*Peziza striispora* Ell. & Ev., Bull. Iowa Lab. Nat. Hist. *4*: 69. 1896.
≡ *Sarcoscypha striispora* (Ell. & Ev.) Sacc. & Syd., Syll. Fung. *14*: 754. 1899.
The holotype of *Peziza striispora* is a specimen of *Cookeina tricholoma* (Mont.) Kunze. This was suggested by Seaver (1928).

*Peziza trachyderma* Ell. & Ev., Amer. Naturalist *31*: 426. 1897.
≡ *Humaria trachyderma* (Ell. & Ev.) Sacc. & Syd., Syll. Fung. *14*: 752. 1899.
≡ *Humarina trachyderma* (Ell. & Ev.) Seav., North American cup-fungi (operculates) p. 139. 1928.

This seems best referred to *Peziza vesiculosa* Bull. ex S. F. Gray. Among collections referred to *P. vesiculosa* this is one of the smallest. *Peziza vesiculosa* has predominantly globose cells in the ectal excipulum, large, smooth ascospores (up to 24 μm long) and apothecia which always occur on dung or manured soil.

## EXCLUDED SPECIES

The following species which were originally described in the genus *Peziza* are members of the Helotiales. For synonyms, the reader is referred to Cash (1953).

*Peziza abdita* Ell., *P. acerina* Cke. & Ell., *P. aquifoliae* Cke & Ell., *P. astericola* Cke. & Ell., *P. borealis* Ell. & Holw., *P. callochaetes* Ell. & Ev., *P. campanula* Ell., *P. carneorubra* Ell. in Cke., *P. cazenoviae* Ell. & Ev., *P. cenangioides* Ell., *P. clavigera* Ell. & Ev., *P. conorum* Ell., *P. cornuta* Ell., *P. craginiana* Ell. & Ev. in Cragin, *P. crinella* Ell. & Ev., *P. crossota* Ell., *P. culcitella* Cke. & Ell., *P. cyphelloides* Ell. & Ev., *P. dinemasporioides* Ell. & Ev., *P. doratophora* Ell. & Ev., *P. earina* Ell., *P. earliana* Ell. & Ev., *P. elongata* Ell. & Ev. in Rehm, *P. fairmanii* Ell. & Ev., *P. frondicola* Ell. & Ev., *P. fumigata* Ell. & Ev., *P. fumosella* Cke. & Ell., *P. fuscidula* Cke. & Ell., *P. fuscocarpa* Ell. & Holw., *P. gaultheriae* Ell. & Ev., *P. gelatinosa* Ell. & G. Martin, *P. glagosa* Ell. & Ev., *P. glenospora* Ell. & Ev., *P. heterocarpa* Ell., *P. heteromorpha* Ell & Ev., *P. hypnicola* Ell., *P. hystricula* Ell. & Ev., *P. incondita* Ell., *P. incrustata* Ell., *P. introviridis* Cke. & Ell., *P. latebrosa* Ell., *P. mauriatra* Cke. & Ell., *P. meleagris* Ell., *P. miniopsis* Ell., *P. mycogena* Ell., *P. nyssaegena* Ell., *P. oenotherae* Cke. & Ell., *P. oleosa* Ell., *P. osmundae* Cke. & Ell., *P. paulopuncta* Cke. & Ell., *P. phlegmacea* Ell., *P. prinicola* Ell. & Ev., *P. prolifica* Ell., *P. regalis* Cke. & Ell., *P. rhabdocarpa* Ell., *P. rhaphidospora* Ell., *P. simulata* Ell., *P. soleniaeformis* Ell. & Ev., *P. solfatara* Cke. & Ell., *P. stictoidea* Cke. & Ell., *P. subgibbosa* Ell., *P. tenella* Cke. & Ell., *P. theioidea* Cke. & Ell., *P. venturioides* Ell. & Ev., *P. yogoensis* Ell. & Gall.

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# ZYGOPLEURAGE, TRIPTEROSPORELLA AND PODOSPORA (SORDARIACEAE: PYRENOMYCETES) IN IRAQ

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## SUMMARY

Fourteen species belonging to *Zygopleurage*, *Tripterosporella* and *Podospora* are discussed and diagnostic keys are composed for the species known from Iraq. Out of these, *Z*. *multicaudata*, *Z*. *faiyumensis*, *T*. *coprophila*, *P*. *fimbriata*, *P*. *bicornis* and *P*. *miniglutinans* are new records for Iraq.

Contributions to the study of coprophilous fungi from Iraq were made by Abdullah et al. (1976), Ahmed et al. (1970, 71) and Ismail and Ahmed (1970). A total of 48 species have been recorded so far. This paper records six more species from Iraq and their illustrated descriptions are provided. Diagnostic keys are provided for all known species of *Zygopleurage* and *Podospora* from Iraq. New distribution data and substratum relationships are added for the previously known species.

## ZYGOPLEURAGE

Boed., Persoonia 2: 316. 1962.

This genus was proposed by Boedijn (1962) to accomodate *Sordaria* *zygospora* Speg. The chief basis was the morphology and development of ascospores. In the young asci, the ascospores are subhyaline, single-celled and more or less elongated. These may or may not be coiled around each other. During maturation two septa are laid down, forming three cells. The end cells develp thick walls and become strongly pigmented while the intermediate cell remains subhyaline and cylindrical. In the mature ascus the intermediate cell of the ascospore tends to collapse leaving separate end cells. Such asci apparently appear 16-spored but a careful search, especially of younger asci, reveals the ramnants of the intermediate cells. The gelatinous caudae are present in all the known species and are best seen in fresh material.

Perithecia subglobose to pyriform with slender neck, ostiolate. Peridium membranous, 3-layered; outer layer pigmented and angular; middle layer of vertically elongated cells and inner layer of irregularly swollen, subhyaline cells. Asci clavate to subcylindrical, unitunicate, 8-spored. Ascospores subhyaline, single-celled and cylindrical when young but become three-celled at maturity. The end cells become strongly pigmented and thick walled while the middle cell remains subhyaline and thin walled. Gelatinous caudae present.

Type species: Zygopleurage zygospora (Speg.) Boed.

## KEY TO THE SPECIES

A. Gelatinous caudae present all around the ascospores (end cells as well as intercalary cell). ..B

A. Gelatinous caudae confined to the end cells; end cells 28-33 x 17-20 µm, ellipsoid; intercalary cell 75-90 x 4-5 µm, cylindrical. 1. Z. multicaudata

B. Intercalary cell 120-175 µm long, cylindrical; end cells 30-36 x 18-22 µm, ellipsoid, covered with 4 distinct gelatinous caudae. 2. Z. zygospora

B. Intercalary cell 60-80 µm long, cylindrical but sometimes inflated in the middle; end cells 40-45 x 22-26 µm, ellipsoid, covered with irregular gelatinous sheath. 3. Z. faiyumensis

1. Zygopleurage multicaudata Mirza
in Mirza and Nasir, Nova Hedwigia 16: 286. 1968.

Perithecia scattered to partially immersed, pyriform, yellowish brown to light brown, 750-1000 x 450-650 µm, with a short cylindrical neck, often darker to almost brownish black in the neck area, covered all over with long (up to 25 µm long and 2-2.5 µm broad), flexuous, light brown, septate, thin to moderately thick walled hairs. Peridium translucent to somewhat opaque, thin and membranous, 3-layered; outer layer with angular to somewhat irregular cells (6-15 µm across); middle layer of vertically elongated cells and inner layer of irregularly globose, subhyaline cells. Paraphyses evanescent. Asci 240-280 x 45-55 µm, clavate to subcylindrical, 8-spored, the walls thin, subhyaline and often collapsing at maturity. Ascospores 2(4) seriate, 3-celled, end cells 28-33 x 17-20 µm, ellipsoid, greenish brown to dark brown; intercalary cell 75-90 x 4-5 µm, subhyaline, cylindrical but often collapsing in dry specimens and difficult to discern. Gelatinous caudae occurring as slender processes all around the end cells but absent on the intercalary cell.

COLLECTIONS EXAMINED: on cow dung, Basrah, Feb. 2, 1977, SKA 237; on buffalo dung, Basrah, Feb. 2, 1977, SKA 238.

This species was first noticed by Ahmed and Asad (1968) from Karachi (Pakistan) and they reported it under _Z. zygospora_ as an abnormal specimen. Later, Mirza and Nasir (1968) again found it from Lyallpur (Pakistan) and described it as a new species. They also observed that the species seems to be widely distributed in West Pakistan. We have noticed two collections of this species from Iraq (Basrah area) and perhaps the species is widely distributed in this part of Asia. The Iraqi collections are typical of the species but the size of ascospores and asci appears slightly larger.

2. _Zygopleurage zygospora_ (Speg.) Boed.
Persoonia 2: 316. 1962.

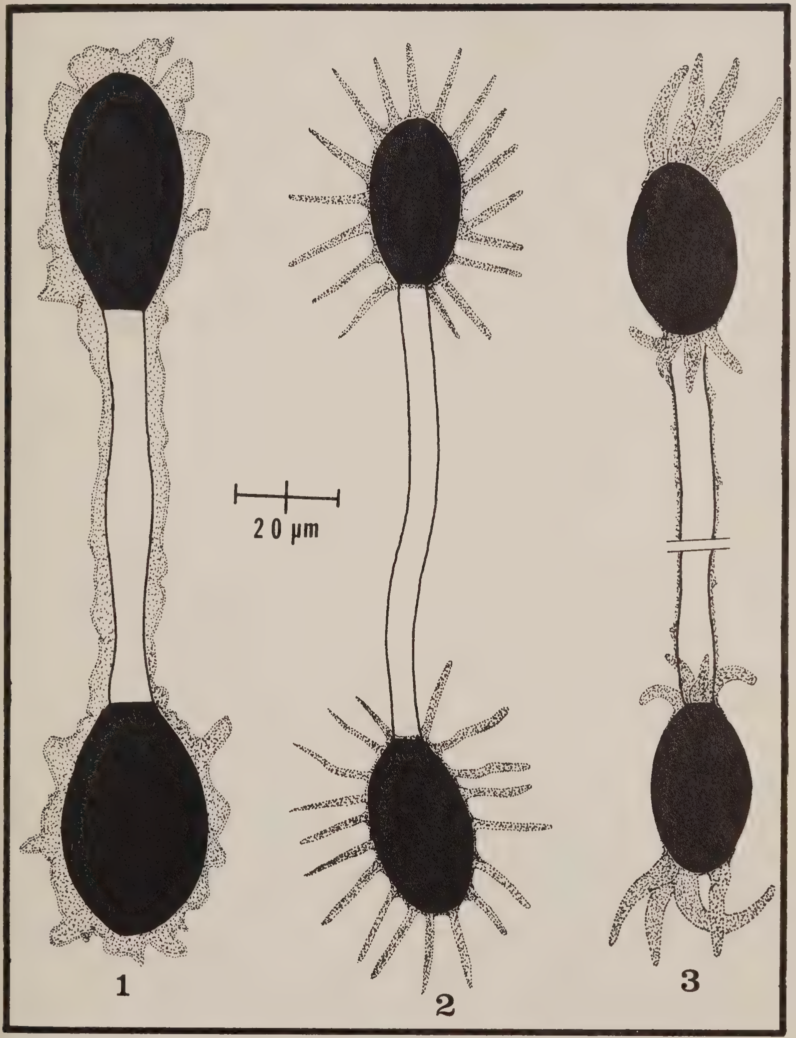
Perithecia scattered, semi-immersed, pyriform, olivaceous brown, 800-1000 x 500-800 µm; neck cylindrical (300-400 x 150-200 µm) and usually covered with long flexuous hairs. Peridium thin, membranous, semi-translucent, 3-layered. Asci 250-350 x 45-55 µm, clavate, 8-spored, the walls thin, subhyaline and collapsing at maturity. Paraphyses evanescent. Ascospores biseriate, 3-celled; end cells ellipsoid, 30-36 x 18-22 µm, dark brown, with 4 distinct gelatinous processes; intercalary cell 120-175 µm long and 5-6 µm broad, cylindrical, subhyaline.

COLLECTIONS EXAMINED: on cow dung, Shaqlawa (Arbil), July 20, 1970, SKA 113; on cow dung, Sulaimania, July 20, 1970, SKA 117; on sheep droppings, Basrah, March 25, 1975, SKA 239; on sheep droppings, Nasriah, Sept. 1, 1974, SKA 240; on horse dung, Kerbala, Sept. 3, 1974, SKA 241.

This species is widely distributed and has been recorded from Europe, Asia and North America. From Iraq, it was first reported by Ahmed et al. (1971) on cow dung gathered from Shaqlawa (Arbil). Since then we have examined several collections of this species from various parts of Iraq.

3. _Zygopleurage faiyumensis_ Lundq.
Bot. Not. 122: 354. 1969.

Perithecia scattered and few, semi-immersed to almost superficial, yellowish brown, 900-1200 x 600-850 µm, pyriform with a short cylindrical neck up to 200 µm long and



Figs. 1-3. Mature ascospores of Zygopleurage faiyumensis (fig. 1), Z. multicaudata (fig. 2) and Z. zygospora (fig.3).

120-140 µm broad, neck darker to almost brownish black. Hairs occurring all over the perithecium, up to 2 µm wide, yellow to yellowish brown, thin walled, septate, flexuous. Peridium translucent to almost opaque, membranous, 3-layered; outer layer composed of angular to somewhat irregular cells, 4-7 µm across, with slightly thick and uneven walls; middle layer of vertically elongated cells appearing like short hyphae; inner layer of subhyaline, large and irregular cells. Paraphyses evanescent. Asci 250-400 x 50-60 µm, subcylindrical to clavate, unitunicate, the walls thin, hyaline and scarcely visible, 8-spored but some evidently 4-6 spored. Ascospores 2-4 seriate, 3-celled, end cells 40-45 x 22-26 µm, ellipsoid with rounded apex and somewhat truncate base, dark brown, smooth, uniguttulate; intercalary cell 60-80 µm long and 6-8 µm broad, cylindrical but occasionally inflated in the middle, hyaline, often collapsing in the mature asci and difficult to discern. Gelatinous caudae all over, covering the end cells as well as the intercalary cell uneven to drawn out in to irregular processes.

COLLECTIONS EXAMINED: on horse dung, Kerbala, Sept. 3, 1974, SKA 242; on cow dung, Basrah, April 2, 1972, SKA 243.

This species is known only from the type specimen which was collected from Faiyum in Egypt (Lundqvist, 1969). This is perhaps the second report of this species. The Iraqi collections are characteristic of the species but possess slightly smaller ascospores, however, these come well within the range of the species.

## TRIPTEROSPORELLA

Subr. & Lodh., Curr. Sci. 37: 245. 1968.

This genus was proposed for a single species marked by nonostiolate ascocarps (cleistothecia) and the nature of ascospores. During the early stages of development the ascospores are subhyaline, long and cylindrical but soon become segmented in to two cells. The upper cell (head cell) becomes pigmented and develops a thick wall while the lower cell (tail cell) remains thin walled and subhyaline. The tail cell is always longer than the head cell. Gelatinous caudae are absent. Tripterospora Cain is very close to but differs from Tripterosporella in the shape of young ascospores which are ovoid to clavate. Moreover, in mature ascospores the tail cell is always shorter than the head cell.

### Tripterosporella coprophila Subr. & Lodh.
Curr. Sci. 37: 245. 1968.

Cleistothecia scattered, superficial, subglobose, 275-350 µm across, brownish black to almost black, hairy. Hairs long, flexuous, 2-3.5 µm wide, slightly thick walled, brown to almost subhyaline near the apices. Peridium semi-translucent to almost opaque, membranous. Paraphyses evanescent. Asci 165-225 x 16-20 µm, subcylindrical to clavate-cylindrical, 8-spored, iodine test negative, the walls thin, subhyaline and collapsing at maturity. Ascospores 2(3) seriate, occasionally uniseriate at maturity, 2-celled; head cell, 21-24 x 12-13.5 µm, ellipsoid to subglobose, the walls moderately thick, olivaceous brown, germ pore apical; basal cell (tail cell) 30-32 x 5-6 µm, subhyaline, cylindrical, straight to slightly curved near the base, thin walled.

COLLECTION EXAMINED: on horse dung, March 3, 1975, SKA 266.

This species was first reported on dung from India (Uttar Pradesh and Rajasthan) by Subramanian and Lodha (1968). It is marked by the morphology and development of the ascospores. The Iraqi collection is typical of the species and appears to be the second report for the species.

## PODOSPORA

Cesati in Raben., Klotzsch Herb. Viv. Mycol. ed.2, No. 259. 1856.

It is a large and unnatural genus but recently it has been revised and circumscribed (Lundqvist, 1972; Mirza and Cain, 1969). As defined here it includes those species only which have pedicellate brown spores with or without gelatinous caudae at each end.

Perithecia nonstromatic, ostiolate. Peridium membranous to coriaceous, 3-4 layered, light brown to almost black. Asci 4 to multispored, clavate to cylindrical or saccate, unitunicate. Ascospores ellipsoid, dark brown to almost black; primary appendage basal, cylindrical to clavate, subhyaline; secondary appendage present or absent; germ pore apical.

Type species: Podospora fimicola Cesati

### KEY TO THE SPECIES

A. Asci 4-spored. ..B

A. Asci 8-spored. ..C

B. Ascospores 19-22 x 10.5-12 µm, ellipsoid in face view but inaequilateral in side view with one side almost flat; primary appendage slender and fugacious; secondary appendage absent. 1. P. inaequalis

B. Ascospores 33-39 x 18-20 µm, ellipsoid; primary appendage cylindrical, 24-28 x 4-4.5 µm; secondary appendage 60-80 x 8 µm, lash-like. 2. *P. anserina*

C. Ascospores comparatively small, 15-22 µm in length. ..D

C. Ascospores medium sized, 25-35 µm in length. ..F

C. Ascospores large sized, 35-45 (55) µm in length. ..H

D. Primary appendage clavate; secondary appendage absent; ascospores 17-20 x 8.5-10 µm, boat-shaped with one side flat. 3. *P. fimbriata*

D. Primary appendage cylindrical; secondary appendage present. ..E

E. Perithecia with agglutinated hairs only; ascospores 17-21.6 x 11-14 µm, ellipsoid. 4. *P. vesticola*

E. Perithecia with agglutinated as well as flexuous hairs also; ascospores 21-22.5 x 12-13.5 µm, broadly ellipsoid to ovoid. 5. *P. miniglutinans*

F. Secondary appendages covered with a diffuse gelatinous sheath which may extend to cover the primary appendage as well; ascospores 27-30 x 16-18 µm, ellipsoid. 6. *P. bicornis*

F. Secondary appendages not covered as above. ..G

G. Ascospores 28-34 x 18.5-20 µm, ellipsoid; primary appendage 26-33 x 5-6 µm, cylindrical; secondary appendage short, crown-like, occurring near the apex of the ascospore as well as near the distal end of the primary appendage. 7. *P. communis*

G. Ascospores 28-45 x 16-22 µm, ellipsoid; primary appendage 17-35 x 6-8 µm, cylindrical but swollen slightly in the middle and at the end; secondary appendage 20-40 x 5-9 µm, lash-like, present at the apex of the ascospore as well as near the distal end of the primary appendage. 8. P. prethopodalis

H. Ascospores 34-45 x 19.5-22.5 µm, ellipsoid; primary appendage 45-60 x 7-7.5 µm, cylindrical; secondary appendage 19-21 x 12-13 µm, cylindrical, occurring in a cluster or tuft near the junction of primary appendage and spore as well as at the apex of the spore. 9. P. decipiens

H. Ascospores 39-50 x 20-27 µm, ellipsoid; primary appendage 28-40 x 6-7 µm, clavate; secondary appendages numerous, present all over the ascospores. 10. P. longicaudata

1. Podospora inaequalis (Cain) Cain
Can. J. Bot. 40: 460. 1962.

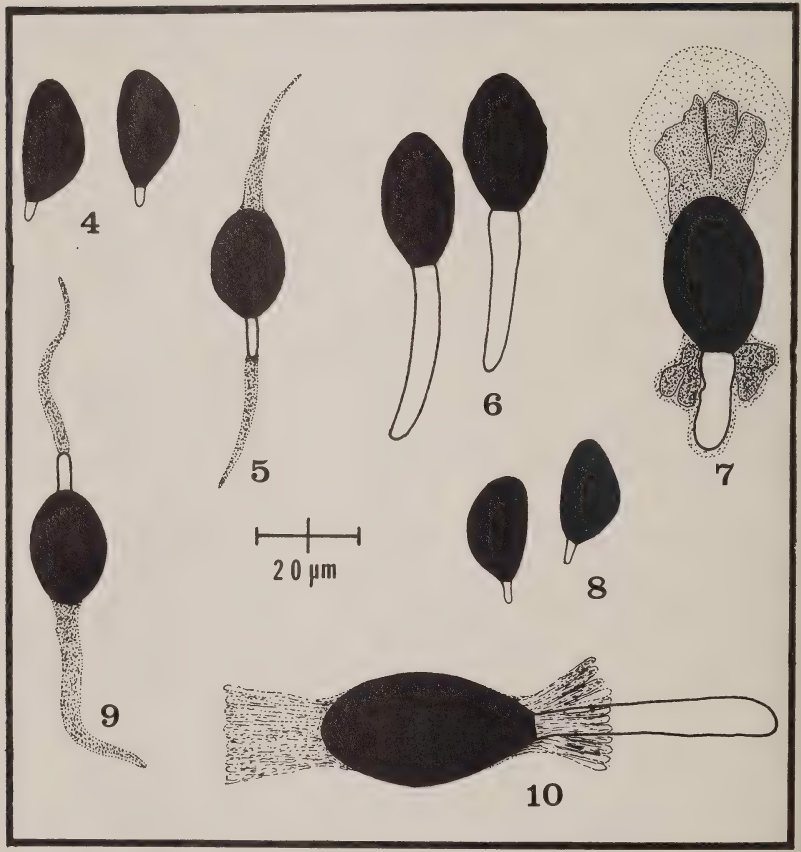
Perithecia scattered, pyriform to ovoid, 175-200 x 120-150 µm, dark brown to brownish black; neck absent or rudimentary. Peridium membranous, thin (5-7.5 µm thick), semitranslucent. Paraphyses evanescent. Asci 80-100 x 12-15 µm, cylindrical, 4-spored. Ascospores 19-22 x 10.5-12 µm, uniseriate, ellipsoid with flattened side and thus appear inaequilateral in side view, thin walled, smooth, brown; primary appendage clavate, 4-5 x 1-1.2 µm, subhyaline; secondary appendage not observed.

COLLECTION EXAMINED: on sheep droppings, Diwania, Jan. 15, 1974, SKA 210; SKA 211; SKA 212.

This species was reported earlier from Iraq by Abdullah et al. (1976). The chief diagnostic features are 4-spored asci, inaequilateral ascospores and presence of primary appendages.

2. Podospora anserina (Rabenh.)Niessl.
Hedwigia 22: 156. 1883.

Perithecia dark brown to almost black, 400-560 x 300-330 µm, pyriform to subglobose with a short, conical neck; usually covered with few tufts of hairs especially in the basal part; hairs up to 200 µm long and 2.5-3 µm broad, straight, nonseptate. Asci cylindrical to subcylindrical, 225-250 x 20-30 µm, 4-spored. Ascospores 33-39 x 18-20 µm, ellipsoid, uniseriate, thick walled, brownish black; primary appendage cylindrical, 24-28 x 4-4.5 µm, secondary appendage 60-80 x 8 µm, lash-like, upper one eccentrically attached to the apex of the spore while the lower one to the distal end of the primary appendage, sometimes two evanescent secondary appendages are also attached at the



Figs. 4-10. Mature ascospores of Podospora inaequalis (fig. 4), P. miniglutinans (fig. 5), Tripterosporella coprophila (fig. 6), P. bicornis (fig.7), P. fimbriata (fig.8), P. vesticola (fig.9) and P. decipiens (fig. 10).

base of primary appendage.

COLLECTIONS EXAMINED: on cow dung, Shaqlawa (Arbil), July 4, 1970, SKA 91; on sheep droppings, Hilla, Jan. 15, 1974, SKA 244; on cow dung, Abu Ghraib (Baghdad), June 6, 1974, SKA 245; on camel dung, Al-Madain, June 6, 1974, SKA 246; on horse dung, Hilla, Jan. 12, 1974, SKA 247.

This species was recorded from Iraq by Ahmed et al. (1971) but since then we have noticed several collections from different localities. It is marked by 4-spored asci large ascospores and presence of a lash-like secondary appendage.

3. Podospora fimbriata (Bayer) Cain
Can. J. Bot. 40: 459. 1962.

Perithecia scattered, partially immersed, dark brown to brownish black, 300-600 x 300-400 µm, pyriform to more less ovoid, with a short subconical neck; usually covered with agglutinated hairs especially in the apical half of the perithecium. Peridium semitranslucent to almost opaque, thin and membranous. Paraphyses filiform but usually collapsing at maturity. Asci 110-140 x 12-14 µm, cylindrical (spore bearing part) but usually with a long drawn out base, 8-spored, thin walled. Ascospores 17-20 x 8.5-10 µm, uniseriate with usually convex side facing each other, boat-shaped with one side almost flat, the walls thin, dark brown; primary appendage basal, 3-5 x 1-1.5 µm, clavate, hyaline. Secondary appendage absent. Germ pore apical.

COLLECTIONS EXAMINED: on cow dung, Basrah, March 3, 1975, SKA 267; on sheep droppings, Basrah, March 3, 1975, SKA 268.

This species is characterised by the presence of fimbriate hairs in the apical half of the perithecia and by the morphology of ascospores. P. inaequalis possesses similar ascospores but the asci in that species are 4-spored. Moreover, the ascospores are also slightly larger in size.

4. Podospora vesticola (Berk. & Br.) Cain & Mirza
ex Kobayasi in Kobayasi et al. Bull. Nat. Sci. Mus.
Tokyo 12: 332. 1969.

Perithecia 600-800 x 220-350 µm, light olivaceous brown, ovoid with a short papillate neck; sparsely covered with short agglutinated hairs. Asci cylindrical, 120-150 x 14-16 µm, 8-spored. Ascospores 17-21.6 x 11-14 µm, ellipsoid, uniseriate, thick walled, dark brown; primary appendage cylindrical, subhyaline, 6-8 µm long and up to 1.5 µm broad; secondary appendage lash-like, upper one slightly eccentric, lower one similar but attached to the distal end of the primary appendage.

COLLECTIONS EXAMINED: on cow dung, Shaqlawa (Arbil), July 20, 1970, SKA 94; on cow dung, Sulaimania, July 2, 1970, SKA 92; on cow dung, Zawita, April 13, 1977, SKA 248.

This species was recorded from Iraq by Ahmed et al. (1971). It comes very near P. miniglutinans but differs in lacking simple, flexuous hairs on the perithecia.

5. Podospora miniglutinans Mirza & Cain
Can. J. Bot. 47: 230-231. 1969.

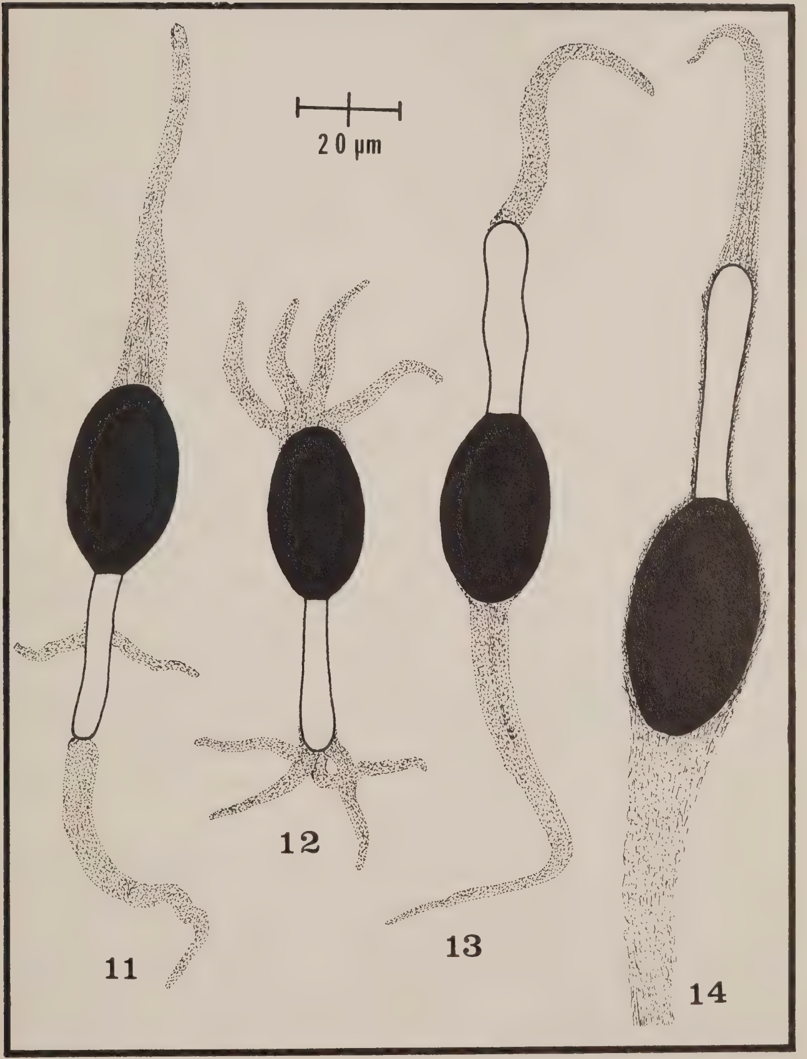
Perithecia scattered, superficial to partially immersed, dark brown to brownish black or almost black especially in the basal part, averaging 500 x 250 µm, pyriform to subconical with a short neck; usually covered with agglutinated haris (especially in the apical half) as well as discreet, long flexuous brown hairs. These are often mixed with short tubercles each consisting of an elongated apical cell and few globose basal cells. Peridium membranous, semi-translucent. Paraphyses evanescent. Asci 200-225 x 17-19 µm, cylindrical to subclavate, 8-spored, thin-walled, amyloid test negative. Ascospores 21-22.5 x 12-13.5 µm, uniseriate but may become biseriate at maturity, broadly ellipsoid to ovoid, the walls moderately thick, greenish brown to brownish black; primary appendage 7-8 x 1.5-2 µm, cylindrical, attached to the base of ascospores, subhyaline. Upper secondary appendage ca. 20 x 5 µm, lash-like; lower secondary appendage narrower, lash-like and attached to the distal end of primary appendage; germ pore apical.

COLLECTIONS EXAMINED: on sheep droppings, Abu Ghraib (Baghdad), June 5, 1974, SKA 264; on cow dung, Zawita, April 13, 1977, SKA 265.

This species is marked by the presence of agglutinated as well as flexuous hairs interspersed with short tubercles, cylindrical primary appendage, lash-like secondary appendages and shape and size of ascospores. P. glutinans (Cain) Cain is very similar but has larger ascospores.

6. Podospora bicornis Lundq.
Svensk Bot. Tidskr. 64: 412. 1970.

Perithecia usually aggregated in small groups, semi-immersed, greenish brown to almost brownish black, 500-600 x 400-450 µm, pyriform with a short cylindrical neck, usually covered with long, flexuous hairs. These may remain discreet or agglutinate forming tufts especially in the neck area. Peridium semi-translucent, membranous. Paraphyses evanescent. Asci 175-225 (275) x 28-32 µm, clavate, with a long tapering base and rounded apex, 8-spored, thin walled, amyloid test negative. Ascospores 27-30 x 16-18 µm, biseriate, ellipsoid, the walls moderately thick, dark brown or olivaceous brown, smooth; primary appendage 12-15 x 6-7 µm, clavate to cylindrical, subhyaline, basal; secondary appendage occurring as upper and lower caudae. Upper caudae 2, separate but more often fused and irregular, surrounded by a diffuse sheath visible in Indian ink mounts only. Lower caudae 3-5, usually fused and irregular, occurring at the junction of spore base and primary appendage, enveloped in a diffuse sheath which extends and covers the primary appendage as well.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Figs. 11-14. Mature ascospores of *Podospora anserina* (fig. 11), *P. communis* (fig. 12), *P. prethopodalis* (fig. 13) and *P. longicaudata* (fig. 14).

COLLECTIONS EXAMINED: on cow dung, Hilla, June 5, 1974, SKA 269; on horse dung, Hilla, June 5, 1974, SKA 270; on horse dung, Baghdad, June 4, 1974, SKA 271.

This species is marked by the nature of secondary appendages as well as shape and size of ascospores. Podospora caligata Khan & Cain (1972) appears very similar but differs in having slightly narrower (13-17 μm) ascospores and by the nature of secondary appendages. Lundqvist (1973) has suggested that perhaps P. caligata is a synonym of P. bicornis.

7. Podospora communis (Speg.) Niessl.
Hedwigia 22: 156. 1883.

Perithecia 700-900 x 350-450 μm, olivaceous brown to brownish black, pyriform with a conical to cylindrical neck; smooth or occasionally covered with long, flexuous and septate hairs. Asci 170-200 x 26-32 μm, clavate, 8-spored. Ascospores 28-34 x 18.5-20 μm, ellipsoid; primary appendage 26-33 x 5-6 μm, cylindrical; secondary appendage short, four, crown-like, occurring at the apex of the ascospore and near the distal end of primary appendage.

COLLECTIONS EXAMINED: on cow dung, Kirkuk, July 3, 1970, SKA 98; on cow dung, Baghdad, June 6, 1974, SKA 249.

This species was recorded by Ahmed et al. (1971) and since then we have examined another collection from Baghdad area. The chief diagnostic features are medium-sized ascospores and presence of crown-like secondary appendages.

8. Podospora prethopodalis Cain
Can. J. Bot. 40: 458-459. 1962.

Perithecia 500-800 x 300-400 μm, dark brown to almost black, subglobose to pyriform; neck short, papilliform to long and cylindrical; covered with brown, septate hairs occurring in tufts. Asci 180-250 x 40-45 μm, broadly clavate, 8-spored. Ascospores 28-45 x 16-22 μm, ellipsoid, dark brown; primary appendage 17-35 x 6-8 μm, cylindrical but slightly swollen in the middle and near the distal end; secondary appendages 20-40 x 5-9 μm, lish-like, present on one end of the ascospore as well as at the distal end of the primary appendage.

COLLECTIONS EXAMINED: on goat droppings, Hamdan (Basrah), Sept.23, 1969, SKA 7; on sheep droppings, Brathaia (Basrah), Sept. 23, 1969, SKA 20; on sheep droppings, Hilla, Jan. 15, 1974, SKA 250; on sheep droppings, Diwania, Jan. 15, 1974, SKA 251; on cow dung, Basrah, Sept. 29, 1971, SKA 252; on goat droppings, Basrah, Sept. 29, 1971, SKA 253; on cow dung, Nasirah, Sept. 6, 1974, SKA 254; on sheep droppings, Kadisia, Jan. 15, 1974, SKA 255.

This species was recorded from Iraq by Ismail and Ahmed (1970) and since then we have recorded several collections from different localities. It comes very near P. communis but differs in the shape of primary and secondary appendages on ascospores.

9. Podospora decipiens (Winter) Niessl.
Hedwigia 22: 156. 1883.

Perithecia 600-780 x 330-420 µm, pyriform with a short neck, olivaceous brown to almost black; usually covered with flexuous septate and brown hairs especially in the basal part. Asci 190-225 x 40-50 µm, clavate, 8-spored. Ascospores biserriate, 34-45 x 19.5-22.5 µm, ellipsoid, dark brown; primary appendage subhyaline, cylindrical, 45-60 x 7-7.5 µm; secondary appendages 19-21 x 12-13 µm, cylindrical, occurring in clusters or tufts near the junction of primary appendage and spore as well as at the apex of the spore.

COLLECTIONS EXAMINED: on cow dung, Sulaimania, July 3, 1970, SKA 99; on horse dung, Hilla, Jan. 15, 1974, SKA 256; on sheep droppings, Hilla, June 5, 1974, SKA 257; on cow dung, Diwania, Jan. 15, 1974, SKA 258; on donkey dung, Hilla, Jan. 15, 1974, SKA 259; on cow dung, Hilla, June 5, 1974, SKA 260; on horse dung, Baghdad, June 4, 1974, SKA 261; on cow dung, Diwania, Jan. 15, 1974, SKA 262; on horse dung, Hilla, Jan. 12, 1974, SKA 263.

This species was reported from Iraq by Ahmed et al. (1971) and since then we have examined several collections of this species from different parts of Iraq. It is marked by the large size of the ascospores and characteristic secondary appendages.

10. Podospora longicaudata (Griff.) Cain
Can. J. Bot. 40: 460. 1962.

Perithecia 600-800 x 470-600 µm, globose to pyriform with a small rudimentary neck, dark brown to olivaceous; semi-immersed, exposed part smooth (without hairs) but immersed part covered with dark brown septate, branched hairs or mycelium. Asci 270-290 x 35-40 µm, clavate, 8-spored. Ascospores uniserriate, ellipsoid, 39-50 x 20-27 µm, dark brown; primary appendage 28-40 x 6-7 µm, subhyaline, clavate; secondary appendages numerous, present all over the ascospores but very long and prominent at the upper end, comparatively smaller at the distal end of the primary appendage, reduced to a mere covering on the sides of spore.

COLLECTION EXAMINED: on horse dung, Shaqlawa(Arbil), July 6, 1970, SKA 100.

This species was recorded from Iraq by Ahmed et al.

(1971). We have not noticed this species again.

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# NOTES ON CORTICIACEAE (BASIDIOMYCETES) II

by

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## Abstract

A new genus *Brevicellicium* is proposed with *Corticium exile* Jacks. as type species. Two new species are described viz. *Hyphoderma subclavigerum* and *Tubulicrinis globisporus*. Two combinations are made viz. *Brevicellicium olivascens* (an earlier name for *Odontia mutabilis* (Pers.)Bres.) and *B. viridulum*.

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*Brevicellicium* K-H Larss.& Hjortst. nov. gen.

*Fructificatio resupinata, effusa, tenuis, hymenio plus minusve pruinoso vel reticulato, membranaceo, levi vel granulato; systemate hyphali monomitico; hyphis basalibus distinctis, cellulis mediocriter prolatis, parietibus fere parallelis, hyphis subhymenialibus item distinctis sed cellulis brevibus, parietibus isodiametris; basidiis Trechisporae similibus; sporis subglobosis vel asymmetricis, non-amyloideis.*

GENERITYPUS: *Corticium exile* Jacks.

Fruitbody resupinate, effused, thin or slightly thickened, hymenium more or less pruinose, with age reticulate to membranaceous, smooth or granulose. Hyphal system monomitic, basal hyphae distinct, with nearly parallel walls, proportionately longcelled, subhymenial hyphae of short, broad, distinctly isodiametric cells. Basidia short, subclavate, somewhat constricted and with 4 sterigmata. Spores subglobose to ellipsoid or lacrimiform, with distinct apiculus, neither cyanophilous nor amyloid.

REMARKS: Eriksson and Ryvarden (1975, p. 453), when describing *Hyphoderma albocremeum* (Höhn.& Litsch.)Erikss.& Strid, briefly discussed another species with similar hyphal structure. They were of the opinion that this species could be more related to *Trechispora* than to *Hyphoderma*. It was later identified as *Corticium exile* Jacks. by Eriksson and Hjortstam.

The genus *Conohypha* with the type species *Corticium albocremeum* was described by Jülich (1975) and primarily delimited by its isodiametric subhymenial hyphae. The species treated below, *Corticium exile, Odontia olivascens* and *Athelopsis viridula* correspond with Jülich´s description of *Conohypha* in having the same kind of subhymenial hyphae. However, the basidia as well as the spores and hyphae are of much larger dimension in the type of *Conohypha*. The new genus *Brevicellicium* is in our opinion more related to *Trechispora* but seperated for example by its smooth basidiospores.

Some other species with smooth basidiospores generally treated in *Trechispora* are *T. confinis, T. amianthina* and *T. byssinella*. The first one is with some doubt delimited from *Brevicellicium* but has a fragile structure and thus resembles *Trechispora farinacea*. The spores of *T. confinis* are, unlike those of *Brevicellicium*, slightly cyanophilous. *T. amianthina* and *T. byssinella* are rather well seperated in their hyphal layer which reminds of *Athelia* sensu lato.

Key to the species of *Brevicellicium*

1 Hymenium grandinioid, spores globose to subglobose......2

1 Hymenium smooth, spores elliptical to tearshaped.........
...........................................*B. exile*

2 Fruitbody sulphur yellow to light greenish. *B. viridulum*

2 Fruitbody whitish to cream-coloured........ *B. olivascens*

*Brevicellicium exile* (Jacks.)K-H Larss.& Hjortst. nov. comb.

BASIONYM: *Corticium exile* Jacks., Can. Journ. Res. 28:721, 1950.

Fruitbody resupinate, effused, thin but not inconspicuous, whitish to cream-coloured, hymenium smooth, under a lens slightly pruinose, margin indistinct. Hyphal system monomitic, basal hyphae thinwalled, 2-3 um wide, with clamps, subhymenial hyphae broad, isodiametric, reaching 8-10 um across, with clamps. Cystidia or cystidial organs lacking.

Basidia short, subclavate, slightly constricted, 10-15 x 5-6 um, with a small clamp at the base and with rather thin, curved sterigmata. Spores smooth, short-ellipsoid, somewhat lacrimiform, 5-6 x 3,5-4 um, with distinct apiculus, non-amyloid.

HABITAT: All Swedish finds from decorticated deciduous wood.

DISTRIBUTION: A few collections from Sweden, Norway, Denmark, Canary Islands and Canada

REMARKS: *Brevicellicium exile* is usually well recognized by its isodiametric hyphal cells and by its small, drop-shaped basidiospores. All material that we studied was identical with the type. The spores vary slightly from 4-6 um in length.

SPECIMENS STUDIED: CANARY ISLANDS. Tenerife, Cruce de la Rosas, 3 km S of la Esperanza, 1974-01-08. Ryvarden 12342. DENMARK. Sjaelland, Korsör skov, on old stump, 1974-11-16. Hauerslev 4938. NORWAY. Oppland, Gausdal, Ormtjernkampen nasj. park, on Picea, 1975-09-21. I. Johansen 1224/75; Nordland, Hamarøj, V. Kilvatnet, on coniferous wood, 1975-09-29. K. Bjørgum 675; Nordland, Bangsund. Å. Strid 11431. SWEDEN. Västergötland. Skepplanda par., N of Skantås, on deciduous wood, 1967-09-25. Hjortst. s.n.; Långared par., W side of lake Anten, on decayed Alnus glutinosa, 1976-06-07. Hjortst. 6701; Medelplana par., Kinnekulle, Råbäck, on deciduous wood, 1976-10-30. K-H Larss.& Hjortst. 7536. CANADA. Ontario, woods W of Maple, on coniferous knot (Tsuga or Pinus), 1942-10-12. Jackson 18831 (TYPE); Bear Island, Timagami, on bark of Thuja occidentalis, 1939-08-24. Jackson 16686.

*Brevicellicium olivascens* (Bres.)K-H Larss.& Hjortst. nov. comb.

BASIONYM: *Odontia olivascens* Bres., Fungi Trid. 2:36, 1892.

*Hydnum granulosum Pers. var mutabile* Pers., Mycol. Europ. 2:184, 1825.
*Odontia mutabilis* (Pers.)Bres., Ann. Mycol. 9:426, 1911.
*Grandinia mutabilis* (Pers.)Bourd.& Galz., Bull. Soc. Mycol. France 30:250, 1914.
*Cristella mutabilis* (Pers.)Parm., Eesti NSV Tead. Akad. Toim. Biol. Seer. 14:223, 1965.
*Trechispora mutabilis* (Pers.)Liberta, Taxon 15:319, 1966.

Fruitbody resupinate, effused, thin to becoming thickened, grandinioid, whitish to cream-coloured, margin indistinct. Hyphal system monomitic, basal hyphae thin, ab. 5 um wide, subhymenial hyphae short-celled, isodiametric, 7,5-8-10 um wide, all hyphae with clamps. Cystidia lacking. Basidia subcylindrical, slightly constricted, 15-20 x 6-8 um, with a clamp at the base and with 4 sterigmata. Spores smooth, subglobose and somewhat asymmetric, 4,5-5 um across, with distinct apiculus, neither cyanophilous nor amyloid.

HABITAT: In Sweden only collected on deciduous wood.

DISTRIBUTION: Not uncommon in the south part of Sweden but rare in the northern part (Strid 1975).

REMARKS: *Brevicellicium olivascens* is well recognized by its grandinioid hymenium and subglobose, slightly asymmetric spores. It is similar to *B. exile* in having isodiametric subhymenial cells.

TYPE SPECIMEN STUDIED: Ad truncos Rosae caninae - "Ortise" VIII 1890 (the protologue says Aestate-Autumno, ad ramos Rosae caninae "Val di Sole"). Herb S.

*Brevicellicium viridulum* (Parm.)K-H Larss.& Hjortst. nov. comb.

BASIONYM: *Athelopsis viridula* Parm., Consp. Syst. Cort. p 203, 1968.

*Corticium sulphurellum* Höhn.& Litsch., Wiesner Festschr., p 66, 1908. Not *Corticium sulphurellum* Cke & Massee, Grevillea 20:35, 1891.

Microscopically it is not possible to seperate *B. viridulum* from *B. olivascens* but in our concept of the species the sulphur-yellow colour is satisfactory to establish *B. viridulum* as a species of its own. *B. olivascens*, which we have collected and studied for several years, is in most cases whitish to cream-coloured, never bright yellow. We have not been able to discern any intermediate stages.

HABITAT: On deciduous wood.

DISTRIBUTION: A little known species and probably very rare in Sweden as well as in the whole of Northern Europe.

REMARKS: Easily recognized species thanks to its colour and to its similarity to *B. olivascens*.

SPECIMENS STUDIED: ESTHONIA. Jögeva, Vooze, on Alnus, 1970-09-16. E. Parmasto; Juudi AO. Oblutsenski r., Bol. Sololi

400-600 m, 1061-08-08. E. Parmasto (TYPE of *Athelopsis viridula*). POLAND. The Carpathians, distr. Gorlice, on Quercus, 1963-08-18. St. Domanski. SWEDEN. Uppland. Uppsala, Vårdsätra naturpark, on Fraxinus, 1937-10-28. S. Lundell, det. John Erikss.

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*Hyphoderma subclavigerum* K-H Larss.& Hjortst nov. spec.

*Fructificatio resupinata, effusa adhaerans; hymenio continuo, albo vel cremeo; margine plus minusve indistincto; hyphis indistinctis, tenuitunicatis, 2,5-3,5 um latis, fibulatis; cystidiis biformibus, 1. cylindricis vel subclavatis, projectis, 90-120 x 10-12 um, 2. clavatis, inclusis, 50-80 x 4-6 um; basidiis clavatis vel subclavatis, 25-40 x 5-6 um, 4 sterigmatibus; sporis suballantoideis, tenuitunicatis, 10-14 x 4-5 um, nonamyloideis.*

HOLOTYPUS: SWEDEN. Västergötland. Medelplana par., Kinnekulle, Råbäck, on branch of deciduous wood, 1976-10-03. KHL & Hjortst. 7293.

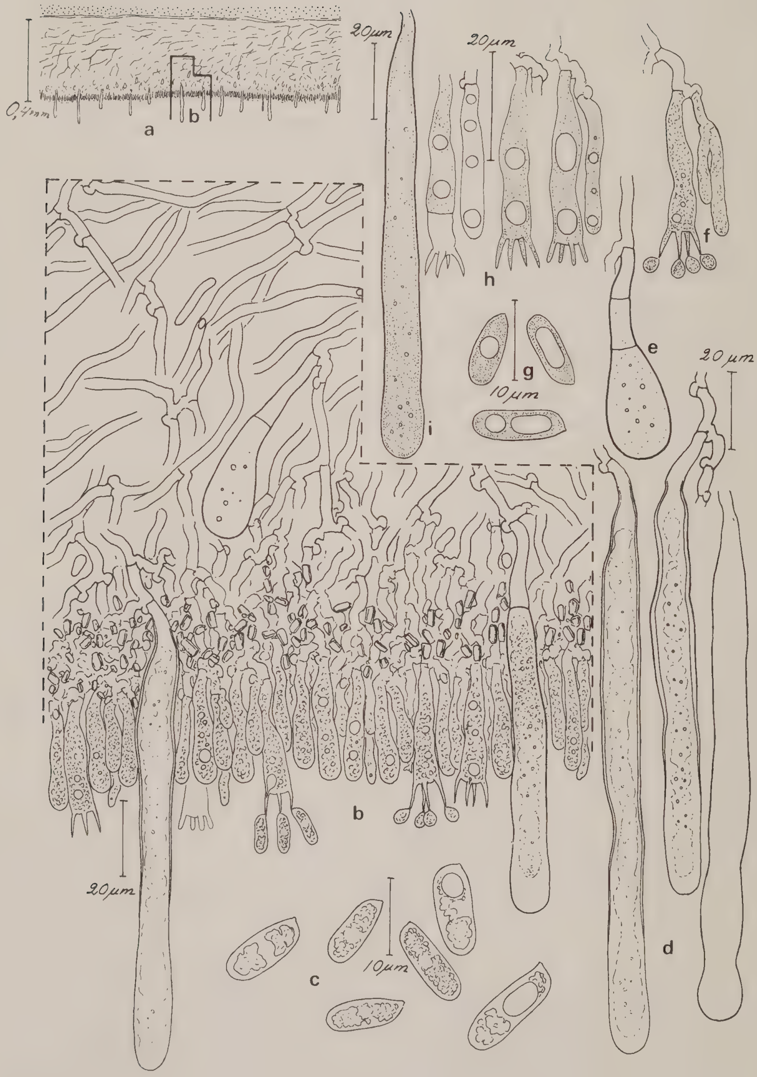
PARATYPI: KHL & Hjortst. 7264, 7288 and 7290.

Fruitbody resupinate, effused, adnate, whitish to dark cream-coloured, margin indistinct. Hyphae thinwalled, branched and with clamps, 2,5-3,5 um wide. Cystidia of two kinds 1. cylindrical to subclavate, projecting, with thin or somewhat thickened walls, 90-150 x 10-12 um, 2. clavate, thinwalled, more or less imbedded, 50-80 x 4-6 um. Both kinds of cystidia sometimes with one or more adventitious septa without clamps. Basidia terminal, subclavate, somewhat constricted, 25-40 x 5-6 um with 4 sterigmata. Spores suballantoid, thinwalled, with oildroplets in the protoplasm, 10-14 x 4,5-5 um, non-amyloid.

HABITAT: On decayed branches and trunks of deciduous trees in herb-rich deciduous wood.

DISTRIBUTION: Only known from Mt Kinnekulle, SW part of Sweden.

REMARKS: Well recognized species by its large cystidia and allantoid spores which measure 12-14 um in length. *H. subclavigerum* is related to *H. clavigerum* (Bres.)Donk in the shape of the cystidia and spores but differs from this species by having larger spores and two kinds of cystidia. The cylindric cystidia of *H. subclavigerum* are also considerably longer and lack the excreted resinous matter of


0,4mm
a
b
20µm
i
20µm
h
f
g
10µm
e
20 µm
b
20µm
c
10µm
d

*H. clavigerum*. It is also related to *H. setigerum* (Fr.)Donk but seems to be well distinguished by its non-septate cystidia and larger spores.

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*Tubulicrinis globisporus* K-H Larss.& Hjortst. nov. spec.

*Fructificatio resupinata, effusa, tenuis, saepe inconspicua, hymenio primum albido deinde ravido; margine indeterminato; hyphis tenuitunicatis post crassiusculis, fibulatis, 2,5-4 um latis, non-amyloideis; cystidiis biradicatis, projectis, subcylindricis, infra medium crassitunicatis, sursum tenuitunicatis, numquam dilatatis, valde amyloideis, circiter 90-120 x 5-7 um; basidiis subclavatis, infra crassitunicatis, 13-15 x 5-7 um, 4 sterigmatibus, nonamyloideis; sporis tenuitunicatis, globosis vel subglobosis, circiter 4 um diametro, nonamyloideis.*

HOLOTYPUS: SWEDEN. Ångermanland. Junsele par., Åkerbränna, on Pinus silvestris, 1970-09-20, Stig Jacobsson & Hjortst. Hjm. 4187.

Fruitbody resupinate, effused, when young very thin and somewhat inconspicuous, with age thickening, whitish to greyish white, under a lens slightly pilose due to the projecting cystidia, margin indistinct. Hyphal system monomitic, individual hyphae thin- to slightly thickwalled, 2,5-4 um wide, with clamps, non-amyloid. Cystidia frequent, strongly amyloid, subcylindric, bi-rooted, thickwalled in lower part, the wall gradually thinning out towards the apex, upper part not expanded, 90-120 x 5-7 um. Basidia clavate, basal wall thickening, with 4 sterigmata, 13-15 x 5-7 um, non-amyloid. Spores nearly globose, about 4 um across, non-amyloid.

HABITAT: On fallen branches and trunks of coniferous wood. Mostly on Pinus but also on Picea and Abies

DISTRIBUTION: Hitherto collected a few times in different parts of Sweden. One record by John Eriksson from Canada,

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Figure. *Hyphoderma subclavigerum*. Type specimen. John Eriksson del. 1977. a) schematical section through fruitbody b) section through hymenium and part of subiculum c,g) spores d,i) projecting cystidia e) enclosed cystidium f,h) basidia. a-e from 2% KOH prep., f-i from cottonblue prep.

British Columbia. According to Oberwinkler (1965) the species is not uncommon in the Alps e.g. Germany, France and Italy.

REMARKS: This species is according to description and figure the same one as Oberwinkler (1965) has treated as *Tubulicrinis cf. callosus* Cunningham. The real *callosus*, the type of which has been studied by us, does not belong to the genus *Tubulicrinis*, but rather to *Hypochnicium* as the basidiospores are thickwalled and cyanophilous and the cystidia not bi-rooted. *Tubulicrinis globisporus* is easily recognized by its thin fructifications, strongly amyloid cystidia, and by its globose to subglobose basidiospores.

ADDITIONAL SPECIMENS STUDIED: SWEDEN. Halland. Särö, 1970-10-06. John Eriks.; Västergötland. Östad par., E of lake Valsjön, on decayed trunk of Pinus silvestris, 1970-10-02. Hjortst. 5006, 5041, 5054; Jämtland. Kall par., Kolåsen, Storvallen, on branch of Picea abies on the ground, 1951-08-21. Berit & John Eriksson 5160. CANADA. British Columbia. Revelstoke Park, 6000-6500 ft, on fallen trunk of Abies lasiocarpa, 1969-07-31. Berit & John Eriksson 13184.

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# DIDYMIUM FLEXUOSUM: AN SEM STUDY

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## SUMMARY

An SEM study of the capillitium and sporelike vesicles of Didymium flexuosum confirms earlier observations with the light microscope which suggested that the vesicles are indeed a part of the capillitium.

## INTRODUCTION

Didymium flexuosum Yamashiro, first described from Japan in 1936 and subsequently from the U.S.A. and other parts of the world, is a very interesting myxomycete. Its special features are (a) the presence of a wall-like columella extending throughout the length of the laterally compressed plasmodiocarps and (b) even more interesting, the presence within the spore mass of large vesicular bodies, similar to the spores in colour and ornamentation but several times larger in size and often irregular in shape. The present study is aimed mainly at investigating the nature of these vesicles, as it is uncertain whether they are giant spores or part of the capillitium.

## MATERIALS AND METHODS

The material used in this study was collected by the author on dead leaves of Coffea arabica L. in Pollibetta, Coorg, India (Herbarium of the Madras University Botany Laboratory No. 2267), and is described in an earlier paper (Kalyanasundaram, 1975).

Since myxomycete spores usually collapse in vacuum, the material was subjected to critical point drying (Anderson, 1951) before being coated for SEM study. The fructifications were first immersed in a drop of Tween 20 solution to wet them and teased with dissection needles to liberate the contents, which were then diluted down with distilled water. The material was washed twice in distilled water, fixed in 1% $OsO_4$ in 0.1 M sodium cacodylate buffer at pH 7.2 for 1½ hours at room temperature, washed in two changes of distilled water and dehydrated in a graded ethanol series; the alcohol was replaced by amyl acetate in a graded series and the material dried in $CO_2$ in a critical point drying apparatus on 5mm square glass slips. The glass slips were mounted on aluminum stubs using double-sided adhesive tape, coated first with carbon followed by gold-palladium in an Edwards 12E6 coating unit, and examined with a Cambridge Stereoscan S4 scanning electron microscope.

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## RESULTS

Unlike the spores, the vesicular bodies were seen to be definitely attached to the capillitial threads (Figs. 1, 2). The vesicles are several times larger than the spores. The ornamentation is similar to that of the spores and consists of irregularly shaped spines which are often confluent (Figs. 2, 3). However, while the wall of the vesicles is even, that of the spore appears highly corrugated, which gives it a somewhat reticulate appearance (Fig. 3). Moreover the vesicles are hollow, as seen from a ruptured vesicles in Fig. 1. The capillitial threads show a high degree of branching and anastomosis.

The calcareous crystals on the peridium are seen as dense, needlelike crystals forming stellate aggregates (Fig. 4), whereas on the columella they are seen as laminate crystals in cupulate formation (Fig. 5).

The above observations confirm the author's suggestion, made earlier on the basis of light microscopial studies (Kalyanasundaram, 1975), that the large sporelike vesicles of D. flexuosum are an essential part of the capillitium.

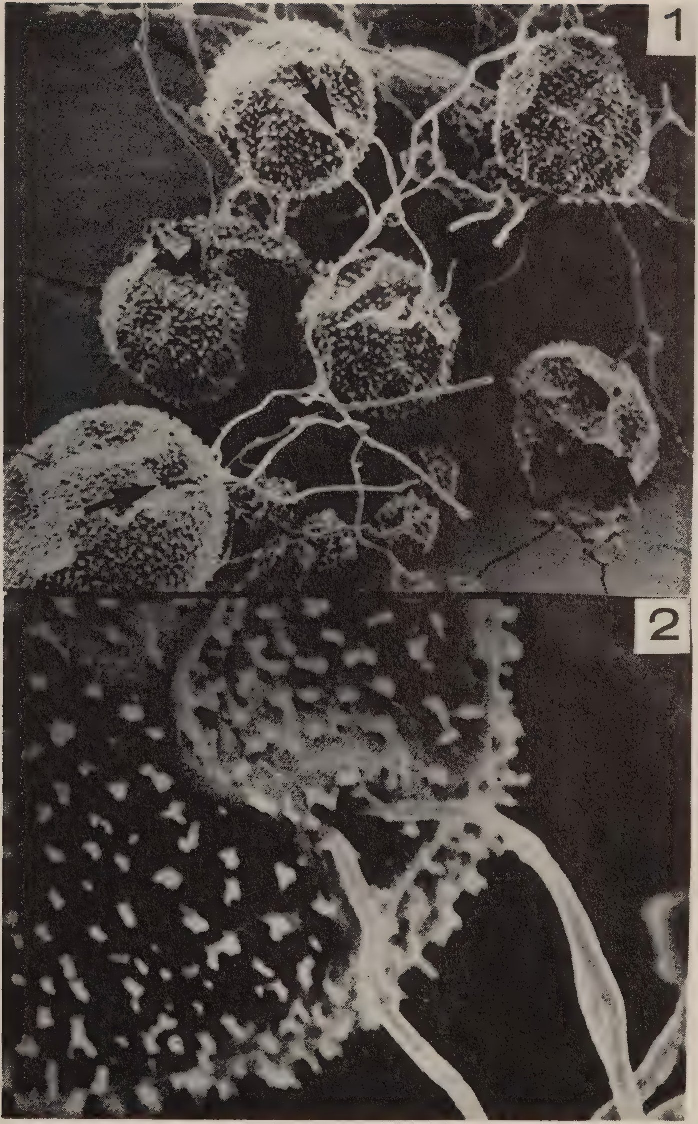
## DISCUSSION

Martin and Alexopoulos (1969), in their description of this species, refer to these vesicles as "......vesicular bodies colored like the spores but paler, larger and more irregular in shape." They state that Yamashiro speaks of the vesicular bodies as borne on the capillitium, but that it is not clear in their material. However, Yamashiro (1936) actually neither speaks of, nor illustrates them as being borne on the capillitium. On the contrary he speaks of them as "...... giant spores, averaging 14-20 μ in diameter, some oval, some elliptical or cocoon-shaped, etc." He describes the capillitium as having calyciform or vesicular-form thickenings, but these refer to the rather insignificant thickenings illustrated by him. Martin and Brooks (1938) in their original description of Didymium parietale, later considered synonymous with D. flexuosum, state that the vesicular bodies are not intimately associated with the capillitium.

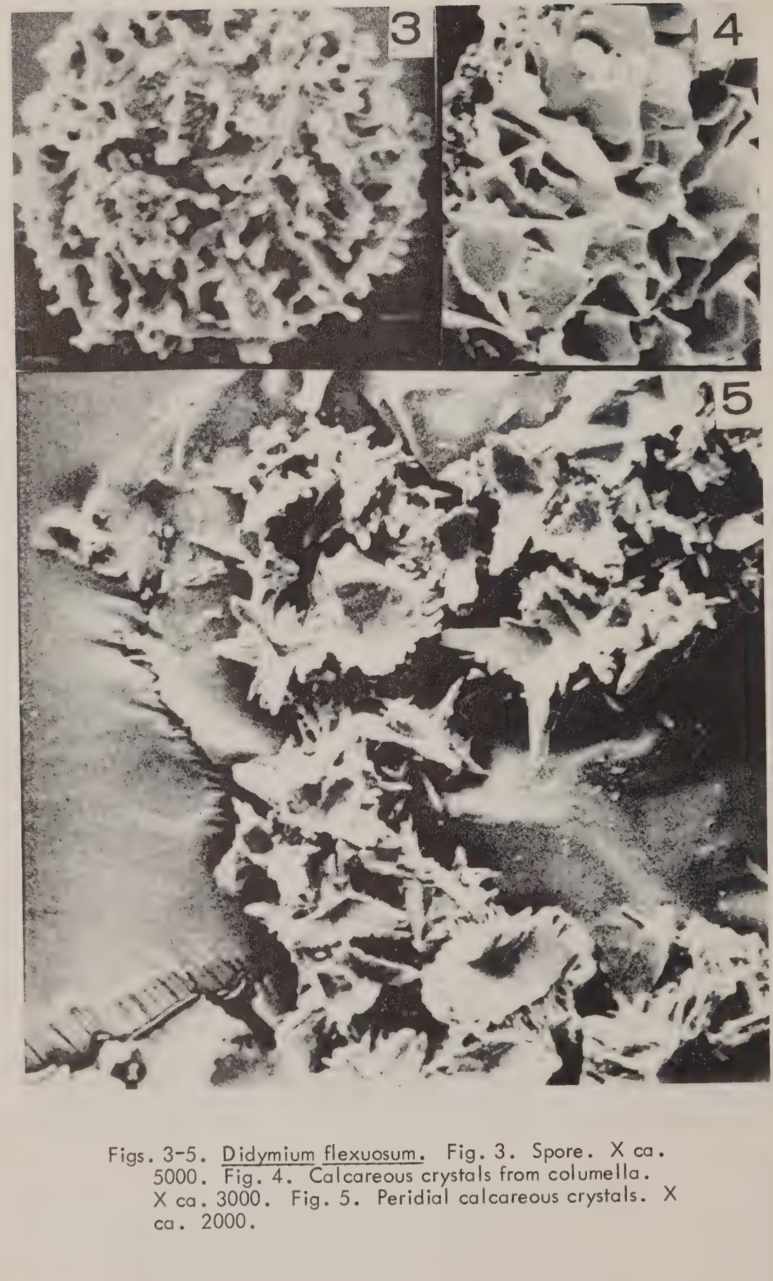
In the first report of D. flexuosum from India, Lakhanpal (1971), merely described the vesicles as sporelike bodies.

Thus the connection of the vesicles with the capillitium, illustrated in the photographs shown here, seems to have been missed in most light microscopical studies, probably because the vesicles get detached from the threads under pressure from the coverslip. These bodies may not be very different from the small vesicular expansions commonly seen in capillitia of several Didymium species, and are perhaps identical with those of D. serpula Fries (Martin and Alexopoulos, 1969). What is remarkable here is the similarity of these vesicles to the spores. It is possible that the walls of the vesicle and the spore are ontogenetically similar. During subsequent development, however, the spore wall has to shrink or convolute to fit the protoplast that it covers, bringing the surface markings closer together to form a reticulate pattern; whereas the vesicle wall remains intact and hollow, so the markings remain distinct.

The calcareous crystals on the peridium differ from those of the columella, as do those of most Didymium species. In the light microscope, those of the columella appear angular and rhomboidal, as shown in the illustrations (Yamashiro, 1936; Martin and Brooks, 1938).



Figs. 1-2. Didymium flexuosum. Fig. 1. Capillitium with network of threads attached to vesicles (arrows point to attachment areas); note spores and a ruptured vesicle in the foreground, X ca. 700. Fig. 2. Part of a vesicle showing attachment of capillitial threads. X ca. 4000.



Figs. 3-5. Didymium flexuosum. Fig. 3. Spore. X ca. 5000. Fig. 4. Calcareous crystals from columella. X ca. 3000. Fig. 5. Peridial calcareous crystals. X ca. 2000.

## ACKNOWLEDGMENTS

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# NOTES ON HYPHOMYCETES. XXII.
# *PHAEOISARIOPSIS BAMBUSICOLA* SP. NOV.

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## ABSTRACT

*Phaeoisariopsis bambusicola* Morgan-Jones, a new species, is described and illustrated from a collection made on leaves of *Bambusa* sp. in Alabama.

## INTRODUCTION

A fungus collected on leaves of *Bambusa* sp. in Alabama has been determined to be an undescribed species of *Phaeoisariopsis* Saccardo. It resembles *Phaeoisariopsis bambusae* (Cooke) Deighton which is known from a single collection made in Assam, India during the latter part of the last century. The new taxon differs from *P. bambusae* by possession of much smaller and more slender conidia. Its conidiophores are also narrower.

## TAXONOMIC PART

*Phaeoisariopsis bambusicola* sp. nov. (Fig. 1).

Coloniae effusae, fuscae, velutinae. Mycelium partim superficiale, partim in substrato immersum, ex hyphis ramosis, septatis, subhyalinis vel pallide brunneis, levibus, 2 - 3μ crassis compositum. Stromata in substrato immersa, pseudoparenchymatica. Conidiophora macronemata, mononemata, fasciculata, ex stromatibus oriunda, simplicia, recta vel flexuosa, laevia, septata, subhyalina vel pallide brunnea, apicem versus pallidiora, usque ad 120 - 240μ longa, 3 - 4μ crassa. Conidia singula, fusiformia vel obclavata, subhyalina vel pallide brunnea, laevia, recta vel leniter curvata, 3-septata, 37 - 56μ longa, 4 - 5μ crassa, basi truncata.

In foliis vivis Bambusae, Chewacla State Park, Lee County, Alabama, April 1976, G.W. Karr Jr., BPI, holotypus.

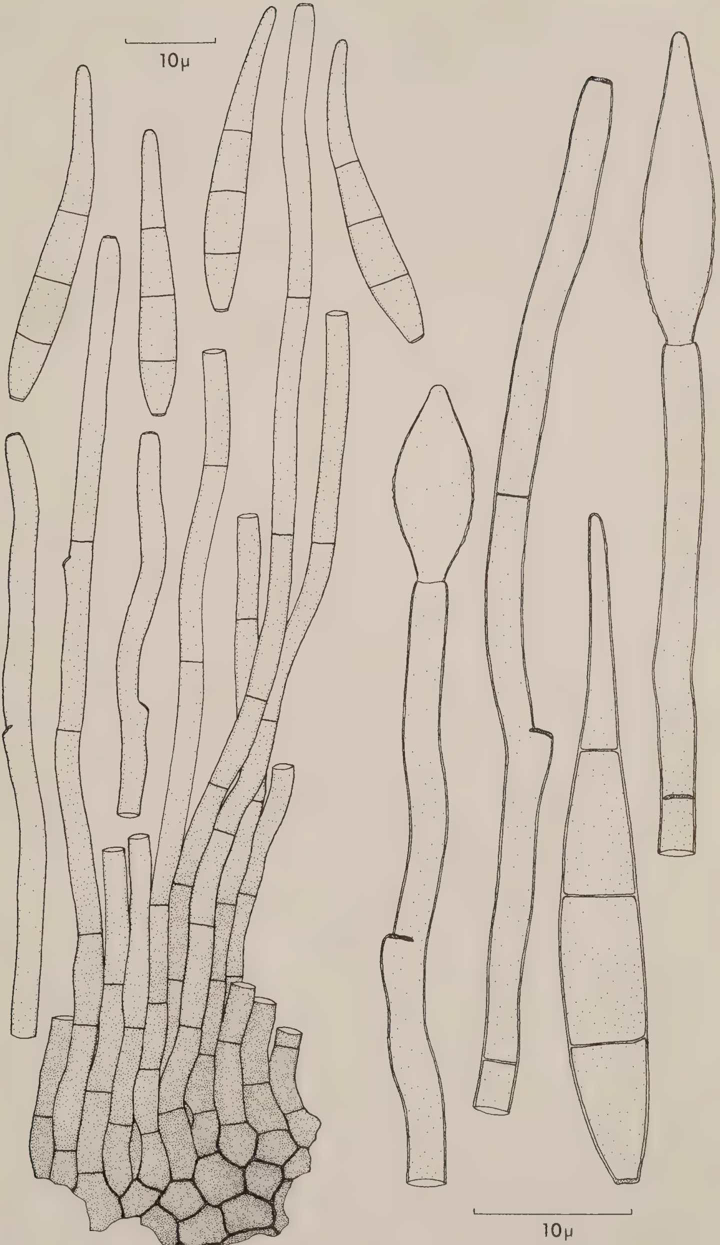

FIGURE 1. *Phaeoisariopsis bambusicola.*

Colonies effuse, dark brown, velutinous. Mycelium immersed in the substratum or partly superficial, composed of branched, septate, subhyaline to pale brown, 2 - 3μ wide hyphae. Stromata at first immersed, later becoming partly erumpent, large, elongate, brown, pseudoparenchymatic. Conidiophores macronematous, mononematous, caespitose, arising from the upper cells of the stromata, simple, straight, or more frequently flexuous, smooth, multiseptate, subhyaline to pale brown, paler towards the tip, proliferating sympodially, scars thin, 120 - 240 X 3 - 4μ. Conidiogenous cells monoblastic or polyblastic, cylindrical, integrated, terminal or intercalary. Conidia holoblastic, solitary, dry, acropleurogenous, straight or slightly curved, fusiform to obclavate, subhyaline to very pale brown, at first appearing roughened, later smooth, 3-septate, apex obtuse, base somewhat truncate at a thin scar, 37 - 56 X 4 - 5μ, 2μ wide at the tip, 3μ wide at the base.

On living leaves of *Bambusa* sp.; North America.

Collection examined: on *Bambusa* sp., Chewacla State Park, Lee County, Alabama, April 1976, G.W. Karr Jr., BPI, AUA, type.

Although both *P. bambusicola* and *P. bambusae* bear caespitose conidiophores from large stromata on leaves of *Bambusa* they can be distinguished by conidium dimensions. Subramanian (1956, 1971) and Ellis (1976) give conidium dimensions of 35 - 91 X 11.2 - 14 and 45 - 120 X 11 - 19 respectively for *P. bambusae*. *P. bambusae* also resembles *Phaeoisariopsis magnoliae* (Ell. and Harkn.) Jong and Morris which was described in a previous paper in this series (Morgan-Jones and Brown, 1976). It differs from *P. magnoliae* in its slightly narrower and longer conidia as well as host relationship. The conidia of *P. magnoliae* are also different in being predominantly two-septate.

## ACKNOWLEDGEMENT

I thank my former student Mr. Guy W. Karr Jr. for allowing me the opportunity to study his collection. Dr. S.C. Jong, American Type Culture Collection, kindly reviewed the manuscript.

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# NOTES ON HYPHOMYCETES. XXIII.
# *PARAPHAEOISARIA ALABAMENSIS* GEN. ET SP. NOV.

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## ABSTRACT

*Paraphaeoisaria alabamensis* de Hoog and Morgan-Jones, a new genus and species, is described and illustrated from isolates from galls caused by *Cronartium quercuum* on *Pinus taeda* in Alabama.

## INTRODUCTION

A survey of microfungi associated with aecial galls of *Cronartium quercuum* f.sp. *fusiforme*, the southern fusiform rust, on trunks of *Pinus taeda* in Alabama, yielded two isolates of a dematiaceous hyphomycete possessing characteristics unlike those of any known genus. In respect of its semi-macronematous, dark conidiophores the fungus bears similarity to the black yeast-like fungi, particularly *Exophiala* Carmichael, but we know of no existing genus in which it can be satisfactorily classified. A new taxon is therefore proposed herein to accommodate it.

## TAXONOMIC PART

*Paraphaeoisaria* gen. nov.

Deuteromycotina, Hyphomycetes.

(Etym. *Phaeoisaria* et Gr. *para*, near).

Coloniae lente crescunt, leves vel floccosae, virides ad olivaceo-nigrae. Hyphae submersae crebro ramosae, leves, crassitunicatae, maturitate olivaceae; hyphae aeriae fasciculatae, pigmento incrustato asperatae. Cellulae conidiogenae intercalares in hyphis indistinctis, unum vel compluria rostra conidiifera proferentes, subinde inconspicue sympodialiter elongascentes. Conidia hyalina, levia, tenuitunicata, breviter cylindrica vel fusiformia.

Species typica: *Paraphaeoisaria alabamensis* de Hoog and Morgan-Jones.

Colonies growing slowly, appearing smooth or floccose, green to olivaceous-black. Submerged hyphae profusely branched, smooth, thick-walled at maturity, olivaceous; aerial hyphae fasciculate, rough-walled due to encrusted pigment. Conidiogenous cells intercalary on undifferentiated hyphae, each with one or several conidiiferous pegs which may later branch in an inconspicuously sympodial manner. Conidia hyaline, smooth, thin- walled, short-cylindrical to fusiform.

*Paraphaeoisaria alabamensis* sp. nov. (Figs. 1 and 2). Coloniae in agaro farina avenacea decocto post 14 dies 20-22°C ad 14mm diametro, primo leves, planae, grisea-albae, margine regulari et acuta delimitatae; subinde flocculosae in medio, olivaceo-virides, mycelio aerio viridi-griseo, ad 2mm alto obtectae. Coloniae in agaro extracto malti decocto ad 1mm altae, leves, lucidae, olivaceo-nigrae margine 1 - 2mm lata hyalina circumdatae, partim floccos myceliales aerios ad 2mm altos formant. Hyphae submersae compactae, primum leves at hyalinae, (0.6-) 1.5 - 2.5µm latae, radiantes, saepe anastomosantes, deinde inspissatae, olivaceae, saepius ramosae, ad 3µm latae, cellulis 8 - 12 µm longis saepe fertilibus; in agaro farina avenacea decocto saepe hyphae ad 3.8µm latae, dense septatae, e cellulis latioribus quam longis constantes; hyphae aeriae fasciculatae, parce ramosae, plerumque 2 - 3.5µm latae, olivaceae, modice crassitunicatae, asperulatae, cellulis (4-) 8 - 12µm longis saepe fertilibus. Cellulae conidiogenae intercalares in hyphis indistinctis, rostris conidiiferis singulis vel compluribus, circa 1.2µm latis and 0.6µm sursum angustatis, 2 - 3µm longis, elongatione sympodiali 1 - 2 (-10) rostra formant e cellula laterali ad 10 (-15) µm longa nonnumquam septo basilari delimitata. Conidia hyalina, levia, tenuitunicata, ellipsoidea, latissima paulo supra medium, vel fusiformes, (2.6-) 3.2 - 5 X 1 - 1.6µm, basi acutata vel rotundata.

Isolatus ex aecidiis Cronartii, Auburn, Lee County, Alabama, July 15, 1976, W.D. Kelley, CBS 101.77B, holotypus.

Colonies on oatmeal agar at 20 - 22°C attaining a diameter of 14mm in 14 days, appearing smooth when young, flat, greyish white, with a rather straight and sharp margin; soon becoming flocculose at the center, olivaceous-green with greenish-grey aerial mycelium up to 2mm high, the marginal part remaining smooth or nearly smooth, finally becoming somewhat lobed. Colonies on malt agar consisting of a 1mm high, elevated, smooth, glistening, olivaceous-black submerged mycelium with a 1 - 2mm wide hyaline margin, with local, pale greyish-olivaceous tufts

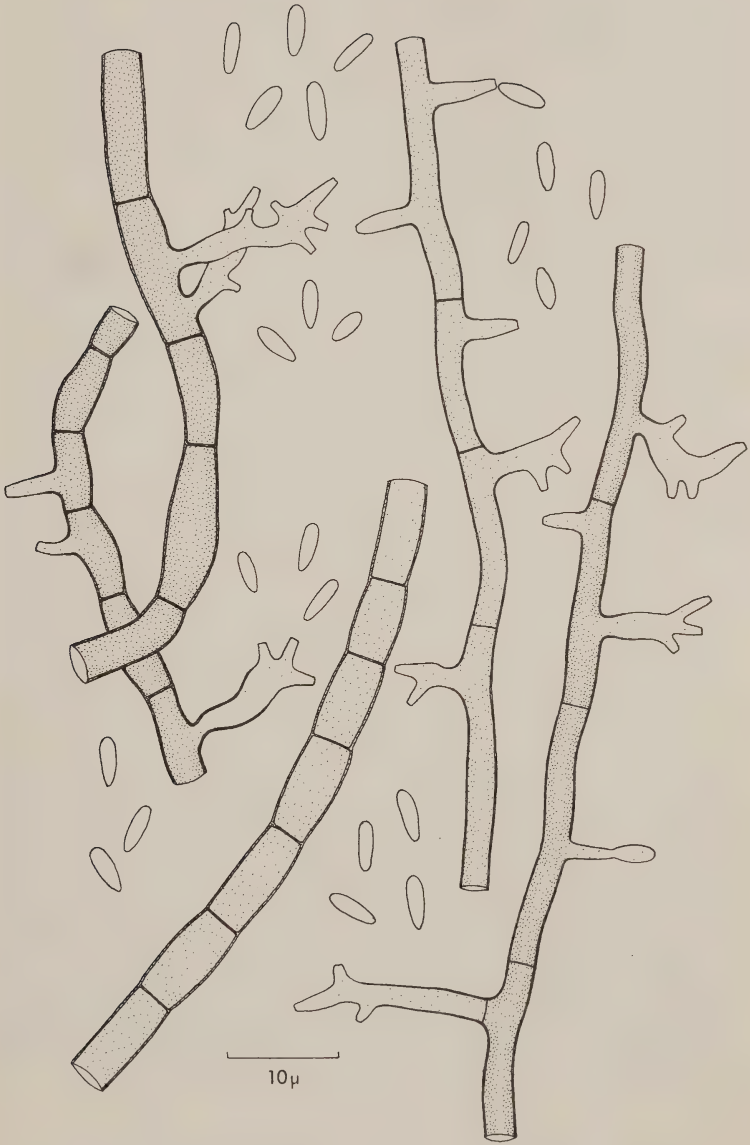

FIGURE 1. *Paraphaeoisaria alabamensis.*

of aerial mycelium up to 2mm high and locally forming a colorless exudate. Submerged mycelium compact, very tough, initially consisting of smooth, hyaline, regular hyphae, (0.6-) 1.5 - 2.5 µm wide, running radially, with numerous anastomoses, later becoming thick-walled, olivaceous, profusely branched, up to 3 µm wide hyphae, with usually 8 - 12 µm long cells, nearly all conidiogenous; submerged hyphae on oatmeal agar locally intermingled with up to 3.8 µm wide hyphae which later become strongly septate, the cells often being wider than long. Aerial hyphae strongly fasciculate, little branched, regular, usually 2 - 3.5 µm wide, olivaceous, somewhat thick-walled, becoming rough-walled due to encrusted pigment, cells (4-) 8 - 12 µm long, frequently conidiogenous. Conidiogenous cells intercalary on undifferentiated hyphae, each one with one or several conidiiferous pegs which are usually about 1.2 µm wide at the base, tapering to 0.6 µm at the apex, 2 - 3 µm long when monoblastic, frequently with 1 - 2 (-10) successive conidiogenous loci being formed in a sympodial manner, the peg often growing out to form an irregularly subulate lateral cell with scattered, occasionally branched pegs which arise at acute angles; lateral cell up to 10 (-15) µm long. Conidia hyaline, smooth, thin-walled, short cylindrical with the widest part somewhat above the middle, or fusiform, (2.6-) 3.2 - 5 X 1 - 1.6 µm, with a rounded or pointed base.

On aecial galls of *Cronartium quercuum* (Berk.) Miyabe ex Shirai f.sp. *fusiforme* on *Pinus taeda* L.; North America.

Collections examined; two isolates from *P. taeda*, Auburn, Lee County, Alabama, July 15, 1976, W. D. Kelley, CBS 101.77B (type), CBS 101.77A.

## DISCUSSION

The process of conidium initiation in *P. alabamensis* is not fully clear. On the apex of the conidiiferous peg a short frill, which resembles a phialidic collarette, often remains (Fig. 2). No percurrent proliferation has been observed. The structure of the conidiogenous cells point to a possible relationship with *Exophiala* Carmichael and *Sarcinomyces* Lindner. The local occurrence of broad, strongly septate hyphae is also reminiscent of the latter genus where they are common (Hermanides-Nijhof, 1977). *Paraphaeoisaria* differs from these two genera, where the conidia are produced in basipetal succession and branched conidiiferous pegs are but rarely produced, by bearing solitary conidia. The conidiogenous cells of *Exophiala* are flask-shaped with attenuate annellated tips. In addition, torulose hyphae and budding cells are common in young cultures of *Exophiala* (de Hoog, 1977) and *Sarcinomyces* species but are absent in *Paraphaeoisaria*. The lateral,

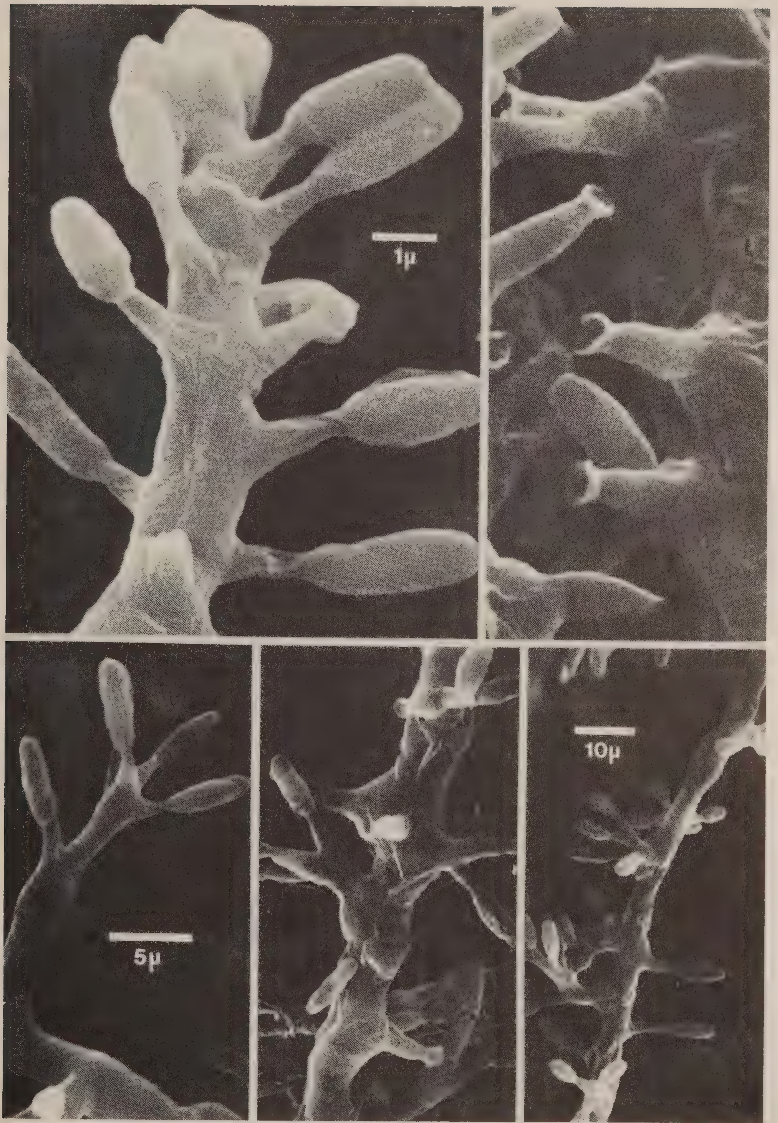

FIGURE 2. *Paraphaeoisaria alabamensis*. Scanning electron micrographs.

more or less sympodially branched, conidiogenous cells are similar to those of *Phaeoisaria glauca* (Ellis and Everhart) de Hoog and Papendorf, but species of *Phaeoisaria* Hohnel have considerably different cultural characteristics and nearly all their conidiogenous cells are lateral or terminal (de Hoog and Papendrof, 1976). Single pegs on intercalary cells are unknown in *Phaeoisaria*.

## ACKNOWLEDGMENT

We thank Dr. Walter D. Kelley for affording us the opportunity to study his isolates and Dr. C.J.K. Wang for kindly reviewing the manuscript.

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# TWO CONTROVERSIAL DISCOMYCETE NAMES

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## 1. *Dasyscypha* Fuckel

This name is now generally taken as a mere orthographic variant of *Dasyscyphus* Gray. As pointed out by me (1976) this practice is in fact illegal, *Dasyscypha* Fckl being an indepedent name. In a recent paper Korf (1977) has argued in favour of the current view. He thinks that Fuckel, when publishing the name, gave an indirect reference to *Peziza* tribus *Dasyscyphae* Fr., the correct author citation then being *Dasyscypha* (Fr.) Fckl, not *Dasyscypha* Fckl. This interpretation will make *Dasyscypha* an obligate synonym of *Dasyscyphus*.

Dr. Korf's remark is very interesting and worthy of serious consideration. I am sorry that I cannot agree with him; it would have made things easier. It is true that an "indirect reference" can be sufficient to validate a name (Art. 32); unfortunately it is also true that the precise meaning of the term is not defined in the Code. However, even with a very liberal interpretation it cannot reasonably be invoked here; the examples given in Art. 32 are widely different from the present case. It is indisputable that Fuckel described *Dasyscypha* with a new generic description, crediting solely himself with the authorship. Of course he was aware of the Friesian tribe *Dasyscyphae*, but knowledge of it is not synonymous to reference to it. On the other hand I may have exaggerated the difficulties which will be the consequence of treating *Dasyscypha* Fckl as an illegitimate homonym of *Dasyscyphus* Gray. I suggested that epithets cannot be transferred from *Dasyscypha* to *Dasyscyphus* "as this would create new illegitimate names: e.g. *Dasyscyphus cerineus* would be antedated by *Dasyscypha cerinea*". As pointed out to me by Mr. E. Gunnerbeck those names are not homonyms, being based on the same type (cfr Art. 64).

## 2. The typification of *Rutstroemia* Karst.

"In choosing a lectotype, any indication of intent by the author of a name should be given preference, unless such indication is contrary to the protologue" (Seattle Code, Guide for the determination of types, p. 76). Conforming to this prescription I have analyzed Karsten's own treatment of Rutstroemia, in different publications, in order to get some clue for the typification of the name (Holm, 1976). I reached the conclusion that *R. amentacea* would be the appropriate choice for a lectotype.

Korf and Dumont (1977) have disagreed, feeling themselves bound by the first lectotypification, viz. Honey's (1928). These authors do not believe "that it can be proved that Honey used *only* the 'simple first species rule' that Holm claims to have been the basis of his choice". On the contrary they hold the view that "Honey weighed other elements in making his lectotypifications, and that therefore the choice may not be superceded under Article 8 of the Code under the rubric of a choice 'made arbitrarily'".

I must persist in a dissentient opinion. There is no indication whatsoever that Honey "weighed other elements" when typifying *Rutstroemia*. On the contrary it is apparent that he was guided by the first species rule only. In his article (1928) Honey lectotypified 4 generic names (*Ciboria*, *Rutstroemia*, *Sclerotinia*, and *Stromatinia*) and in *all* cases he choose the first species.

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# GEOCORYNE, A NEW GENUS OF DISCOMYCETES FROM MACARONESIA AND INDIA

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## *SUMMARY*

Two undescribed inoperculate discomycetes with an outermost apothecial gel layer are described as new and asigned to a new genus of the Leotiaceae, *Geocoryne* Korf. The type species, *G. variispora* Korf, occurs in the Canary Islands and has large apothecia easily mistaken for an operculate discomycete. An Indian species, *G. exogloea* Singh & Tewari, has smaller apothecia and ascospores, and different paraphyses. Both occur on bare soil. The closest relatives of the new genus are *Ascocoryne* with wood and bark-inhabiting species, and *Pezoloma* with species on watersoaked wood, stems and decaying leaves, both of which differ in tissue structure from *Geocoryne*.

A relatively common, large, soil-inhabiting discomycete in the Canary Islands in one region on Tenerife (and also known from two collections on Gomera) was assumed by the senior author in the field to be an operculate discomycete belonging to the genus *Peziza* St.-Amans, though the translucent outer surface also brought to mind another operculate discomycete genus, *Discina* Fries. It proves instead to be an inoperculate species with the outer layer of the apothecium composed of hyphae immersed in a copious gelatinous matrix. There are few, large, soil-inhabiting inoperculate species of discomycetes, and no appropriate genus apparently exists for this fungus. It must clearly be assigned to the tribe Leotieae of the Leotiaceae (Helotiales) in Korf's (1973) classification.

A second, congeneric species from India was called to Korf's attention by Singh and Tewari. Their proposed new species differs from the Macaronesian material in having smaller ascospores, smaller apothecia, and different paraphyses, but like it, occurs on bare soil. They originally assigned their species to *Pezoloma* Clements (= *Sphagnicola* Vel., = *Ciliatula* Vel., = *Pseudodiscinella* Dennis). That is clearly an allied genus, with apothecia on watersoaked wood, stems and decaying leaves, which differs in having a more restricted basal pad of gel tissues and an inner ectal excipulum with large, brick-shaped or isodiametric cells.

The two species constitute a new genus, *Geocoryne*, a name coined from the habitat and the gross similarity, particularly of the developing apothecia, to *Ascocoryne* Groves & Wilson. Members of that genus have apothecia on wood, with the outermost layer of the excipulum composed of angular cells, enclosing the gelatinized medullary excipulum. In *Geocoryne* there are no angular or brick-shaped cells, but all apothecial tissues are composed of long-celled hyphae. The ectal excipulum is two-layered, the outermost composed of hyphae widely dispersed in a gelatinous matrix, often not quite reaching the margin, and an inner ectal layer of non-gelatinized textura porrecta. The medulla is composed of textura intricata immersed in a not particularly evident gel matrix.

## GEOCORYNE Korf, gen. nov.

Apothecia terrae nudae insidentia, parva vel modice magna. Excipulum ectale e duobus stratis constans: stratum interius e textura porrecta non gelatinosa et marginem et hypharum zonam excipulo medullari gelatinoso contiguam formante consistens; stratum exterius e textura intricata consistens, hyphis dispersis et in matrice gelatinosa immersis. Asci porus per KOH affectus in iodo caerulescens. Genus *Ascocorynae* Groves & Wilson affine sed texturae angularis/prismaticae strato ectali exteriore carens, itidem *Pezolomati* Clements affine sed texturae angularis/prismaticae strato excipulari interiore carens.

Species typica: *Geocoryne variispora* Korf.

*Apothecia* on bare soil, small to moderate in size. *Ectal excipulum* of two layers, innermost of textura porrecta lacking a gelatinous matrix that forms both the margin and a band of hyphae adjacent to the gelatinized medullary excipulum; outermost excipular layer of widely spaced hyphae immersed in a gelatinous matrix. *Ascus* pore blueing in iodine after KOH pretreatment. Differs from *Ascocoryne* in the absence of an outermost ectal layer of textura angularis/prismatica, and differs from *Pezoloma* in lacking an inner excipular layer of textura angularis/prismatica. Holotype species: *Geocoryne variispora* Korf.

ETYMOLOGY: *Geo-*, from the Greek, earth, + *-coryne*, from the generic name *Ascocoryne*.

### 1. Geocoryne exogloea Singh & Tewari, sp. nov.

(PLATES 1 & 2)

Apothecia 3-12 mm diam, 2-5 mm alta, substipitata, tenue cupulata infundibuliformia, flavidula, in sicco rufo-brunnea; excipulum medullosum textura intricata constitutum, hyphis 5.0-6.5 µm latis, excipulum ectale etiam textura intricata, hyphis laxe dispositis in matricem gelatinosam non ad marginem extensam immersis, circa 3.5-5.0 µm latis; asci ope jodi caerulescentes, octospori, cylindrici, 84-101.5 × 5.0-10.5 µm; ascosporae ex ovale ellipsoideae, 1-2-guttulatae, oblique uniseriatae vel irregulariter biseriatae, 6.5-11.5 × 3.5-4.5 µm; paraphyses 2-3-septatae, prope basim ramosae, filiformes, ca. 105 × 2.0-3.0 µm. Typus: BHUPP 907.

*Apothecia* substipitate, 3-12 mm in diam and 2-5 mm in height (including stipe), scattered; hymenium flat, pale yellow, turning reddish brown on drying; receptacle shallow cupulate to funnel-shaped, concolorous with the hymenium; margin smooth, slightly recurved on drying; stipe very short, tapering towards the base. In section: *hymenium* 82-205 µm thick; *subhymenium* 12-65 µm thick; *medullary excipulum* 164-656 µm thick, of textura intricata, hyphae 5.0-6.5 µm wide; *ectal excipulum* 41-389 µm thick, of textura intricata with widely spaced hyphae embedded in a gelatinous matrix, but the gel layer not extending all the way to the margin, hyphae 3.5-5.0 µm wide and not blued by iodine; stipe similar to receptacle in tissue structure; *asci* with J+ pore, 8-spored, cylindrical, 84-101.5 × 5.0-10.5 µm; *ascospores* ellipsoidal to oval, 1-2-guttulate, the guttae often unequal and separated by 1 or 2 protoplasmic bands, obliquely uniseriate or biseriately arranged, 6.5- 11.5 × 3.5-4.5 µm; *paraphyses* 2-3-septate, branched 2 or 3 times in the lower half, filiform, equal in length to the asci.

ETYMOLOGY: Refers to the sticky and gelatinous nature of the receptacle.

HABITAT: On soil.

TYPE LOCALITY: *INDIA:* Majhkhali (Ranikhet), Almora, U.P.

HOLOTYPE: BHUPP *907*, K. B. Khare, October 7, 1968; ISOTYPE, CUP-IN *565*.

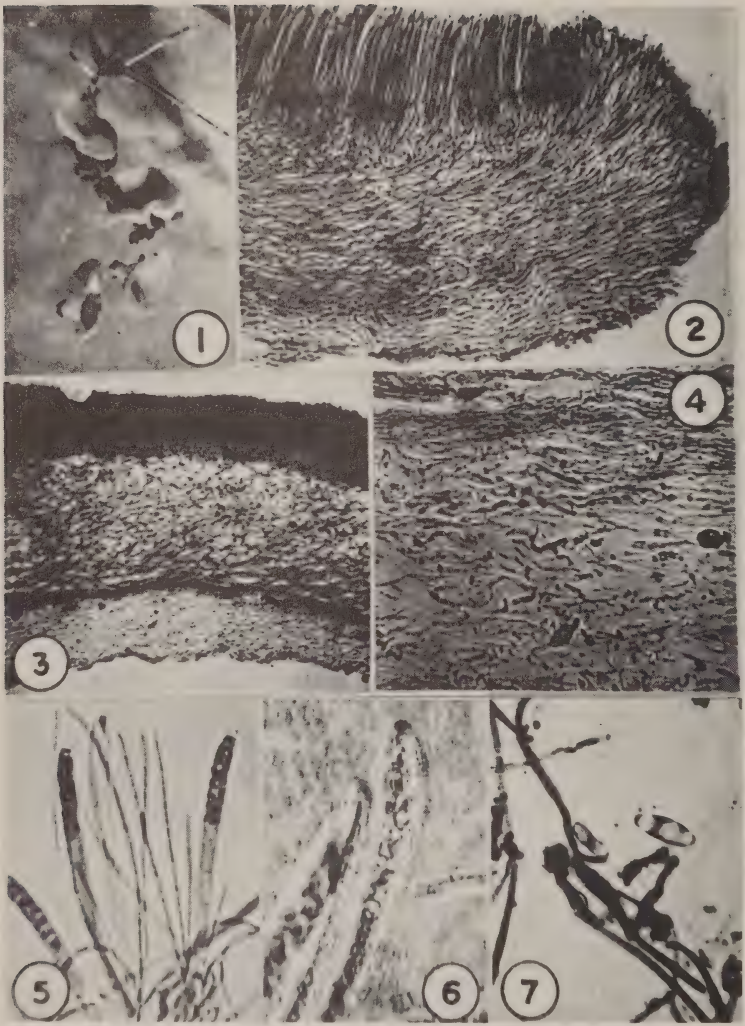


PLATE 1. *Geocoryne exogloea*. 1. Apothecia on soil, × 1.4. 2. Vertical section of apothecium showing marginal tissue, subhymenium and hymenium, × 130. 3. Vertical section of apothecium showing tissues, × 50. 4. Part of ectal and medullary excipulum, × 50. 5. Asci and paraphyses, × 400. 6. Asci showing pores, × 800. 7. Ascospores, × 1000.

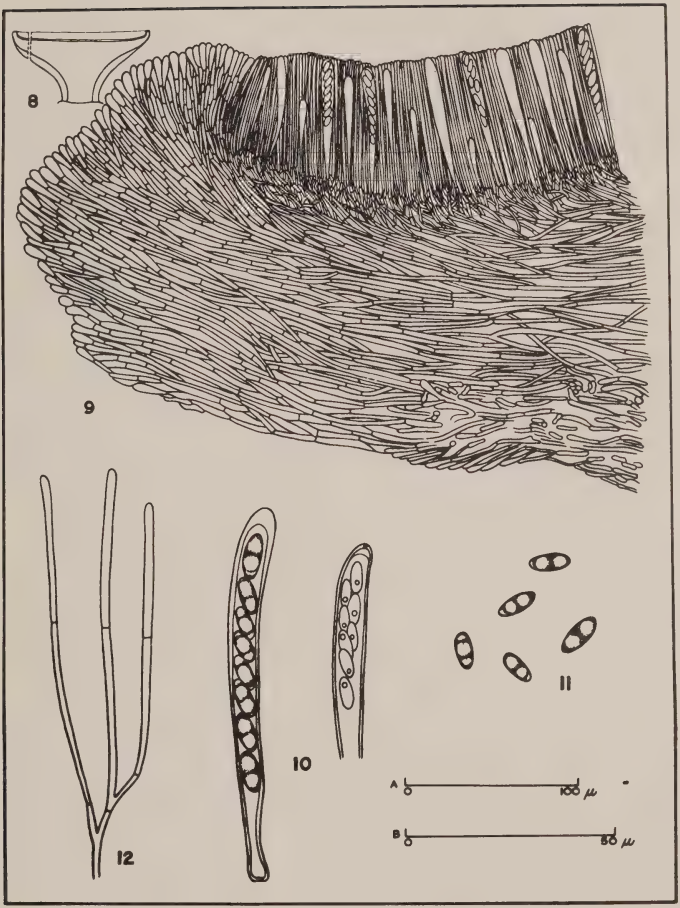


PLATE 2. *Geocoryne exogloea*. 8. Apothecium (diagrammatic). 9. Vertical section of apothecium showing tissue structure, gelatinized layer just beginning at lower right. 10. Asci with ascospores. 11. Ascospores. 12. Paraphysis. Scale line A for fig. 9; B for figs. 10-12.

## 2. Geocoryne variispora Korf, sp. nov.

(PLATES 3 - 5)

Apothecia ochracea vel brunneolo-vinacea, extus translucentia, profunde cupulata vel applanata. Excipuli ectalis stratum exterius gelatinosum 20-250 (-600) µm crassum, e textura intricata constans; stratum interius non gelatinosum e textura porrecta constans. Asci 75-90 × 6.6-10.2 µm. Ascosporae hyalinae, (8-) 9.5-16.1 (-18.3) × 5.1-6.6 (-7.3) µm, magnitudine et forma intra quemque collectionem valde variabiles. Paraphyses filiformes, infra non ramosae, non septatae, apicibus saepe deformibus et brevissime ramosis. Typus: CUP-MM 3.

*Apothecia* ochraceous to brown to brownish violaceous, exciple paler and more or less translucent, turbinate when young, deep cupulate to nearly applanate at maturity, up to 1.5 (rarely to 3) cm diam, constricted below into a short, stemlike base, separate or gregarious, sometimes fused together along the sides or edges where they meet. *Ectal excipulum* of two major layers, the outer of hyphae immersed in a gel, the inner of hyphae without gel; outer layer often not reaching the margin, usually beginning 100-250 µm below the margin, becoming 20-250 (-600) µm broad as it approaches the base, thickness varying greatly between collections (apparently based on moisture conditions), consisting of moderately thin-walled hyphae widely spaced in a gelatinous matrix, individual hyphae straight or spirally coiled, 1.5-5.0 µm diam, forming a loose to fairly tight textura intricata, usually with an outer cortex-like zone of more densely packed, up to 8.8 µm broad, more densely staining and thicker-walled hyphae irregularly arranged or sometimes parallel to the outside or frequently turning outwards to form a gelatinized trichodermium (soil algae are sometimes trapped in the outermost gels); inner layer of the ectal excipulum of densely staining hyphae, forming a textura porrecta in an irregular and rather narrow band (ca. 20 µm broad) parallel to the outer surface and separating the ectal excipulum from the medullary excipulum, but flaring outward to form the whole margin at the point where the outer layer tapers down and ceases to exist. *Medullary excipulum* of a fairly tight textura intricata, cells not strongly staining, immersed in a gelatinous matrix but the gel usually not particularly noticable, hyphae very variable in size, 2.0-14 µm broad, sometimes constricted at the septa. *Subhymenium* scarcely differentiated from the medullary excipulum, but sometimes forming a more densely staining zone about 20 µm thick below the hymenium, of a tight textura intricata to a vertical textura porrecta. *Asci* clavate-cylindric, 75-90 × 6.6-10.2 µm, with a thick apex, pore not reacting to iodine unless pretreated with KOH and then distinctly J+, 8-spored, not infrequently with some asci with 4 or fewer spores. *Ascospores* exceptionally variable within collections (and sometimes between collections), both in size and in shape, hyaline, ellipsoid to fusoid to allantoid, with 1, 2 or more guttulae, (8-) 9.5-16.1 (-18.3) × (4.4-) 5.1-6.6 (-7.3) µm. Paraphyses filiform, aseptate, about 1.5 µm broad and unbranched below, slightly enlarged and often deformed or irregularly branching at the very apex, equalling or slightly exceeding the asci.

ETYMOLOGY: Refers to the great variability in spore shape and size within each collection.

HABITAT: On bare soil, sometimes among mosses.

TYPE LOCALITY: *SPAIN, CANARY ISLANDS, Tenerife:* on soil, Las Mercedes, 2.5 km toward El Moquinal on road from La Laguna to Pico del Inglés.

HOLOTYPE: CUP-MM *3*, R. P. Korf, W. C. Denison, L. M. Kohn & M. A. Sherwood, 4. I. 1976; ISOTYPES, FH, K, OSC, TFMC.

PARATYPES: *SPAIN, CANARY ISLANDS, Gomera:* In footpath, Lomo de Cerpa, s.w. of Agulo, ca 1030 m alt., G. Gulden *101/73*, 9. I. 1973 (CUP-MM 1161, O). On naked soil, same data, G. Gulden *105/73* (CUP-MM 1163, O).

*Tenerife:* On soil, Monte Cruz de Taborno in *Laurus/Erica* forest, A.-E. Torkelsen *144/74*, 9. I. 1974 (CUP-MM 1139, O). On soil, Monte de las Mercedes in *Laurus* forest, A.-E. Torkelsen *451/74*, 18. I. 1974 (CUP-MM 1145, O). Same data, A.-E. Torkelsen *478/74* (CUP-MM 1149, O). On soil, Las Mercedes, 2.5 km toward El Moquinal on road from La Laguna to Pico del Inglés *(topotype)*, R. P. Korf, W. C. Denison, L. M. Kohn & M. A. Sherwood, 4. I. 1976 (CUP-MM 5). On soil, Las Mercedes, 3 km south west of Bailadero, same collectors, 4. I. 1976 (CUP-MM 20). On soil, Las Mercedes, 1.5 km toward El Moquinal on road from La Laguna to Pico del Inglés, same collectors, 4. I. 1976 (CUP-MM 43, OSC, TFMC). On soil, 0.5 km toward Orilla from c.f. 9, 4.2 km from Pedro Alvarez, Monte de las Mercedes, same collectors, 5. I. 1976 (CUP-MM 129, OSC, TFMC). On soil, Las Mercedes, 2.5 km toward El Moquinal on road from La Laguna to Pico del Inglés *(topotype)*, same collectors, 7. I. 1976 (CUP-MM 214). Same data *(topotype)* (CUP-MM 215). On soil, Fayal-Bresal near Rogne de los Passos on road from Taganana to Valle Jiminez, Anaga, R. P. Korf, W. C. Denison, L. M. Kohn, M. A. Sherwood, W. Wildpret, E. Beltrán & A. Beñares, 10. I. 1976 (CUP-MM 419, OSC, TFMC). Same data (CUP-MM 420). Same data (CUP-MM 426). Same data (CUP-MM 427). Same data (CUP-MM 436). On soil, just below west entrance, Monte de las Mercedes, R. P. Korf, W. C. Denison, L. M. Kohn & M. A. Sherwood, 10. I. 1976 (CUP-MM 453). On mossy soil along trail, west of Fuente de las Pulgas, Las Yedras, Monte de las Mercedes, same collectors, 12. I. 1976 (CUP-MM

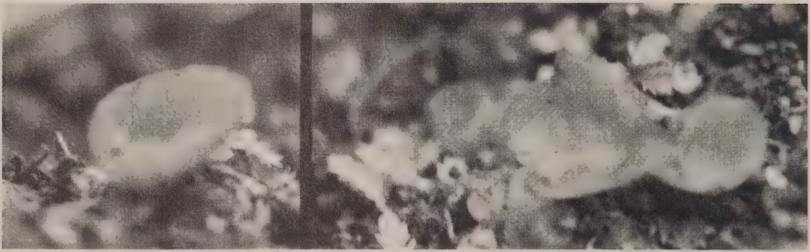


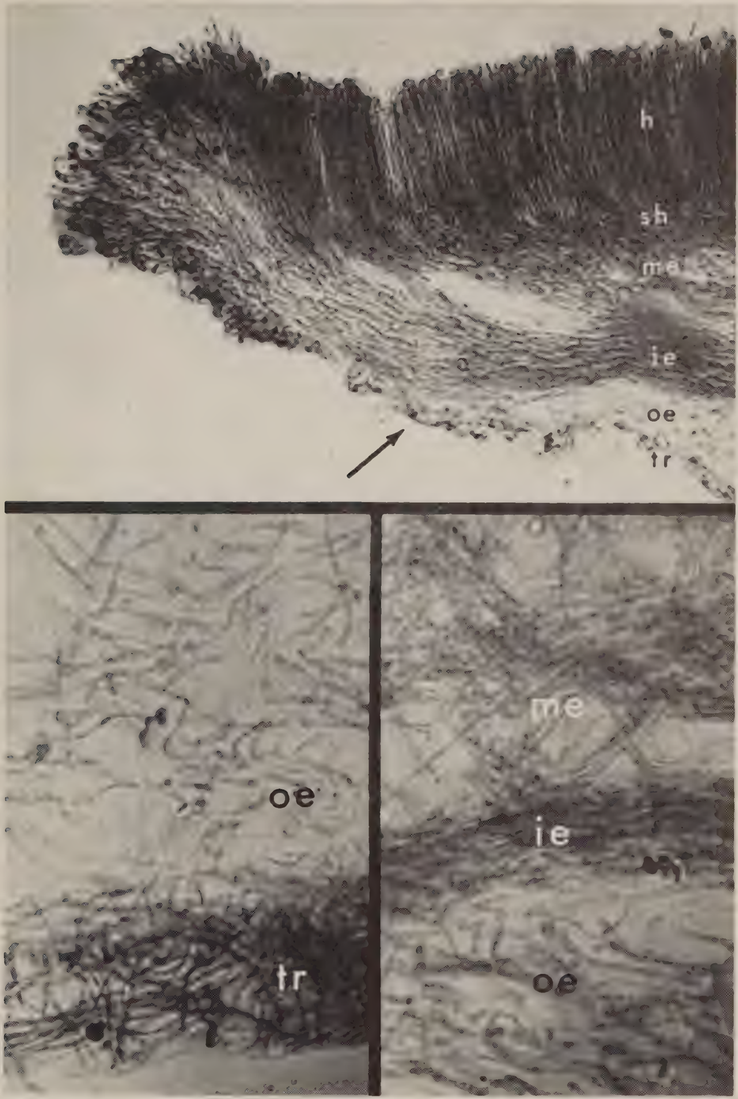
PLATE 3. *Geocoryne variispora.* Left, deep cupulate, subotideoid apothecium. Right, clusters of turbinate, immature apothecia and cupulate, mature apothecia, fused at base or margin. CUP-MM 1208, × 1.86.

548). On soil, 3.5 km toward El Moquinal from intersection of road from Las Mercedes to Pico del Inglés, R. P. Korf, R. Fogel, G. L. Hennebert & L. M. Kohn, 28. XII. 1976 (CUP-MM 1208). On mossy soil, 1 km west of Fuente de las Pulgas, Las Yedras, same collectors, 30. XII. 1976 (CUP-MM 1282, TFMC).

*NOTES:* The very localized distribution of this species is noteworthy. Two specimens in the Oslo Herbarium were collected from one locality on the island of Gomera. Three collections from the Oslo Herbarium and 16 collections by the Cornell group were all taken on Tenerife in the Monte de las Mercedes region within a radius of 4 km. The Cornell groups never found the species on any other part of Tenerife, nor on the islands of Gomera, Hierro, Gran Canaria or La Palma, nor in their exploration of another Macaronesian island, Madeira. In December and January, when all known collections were made, this species was certainly the dominant soil inhabiting discomycete in the Monte de las Mercedes region.

The ascus pore of this species does not blue in iodine when the material is merely rehydrated in water and mounted in

PLATE 4. *Geocoryne variispora.* Top, cross section of apothecium, CUP-MM 419, × 250. Below, CUP-MM 548, × 500; left, part of ectal excipular layer and trichodermium; right, part of outer excipular layer, inner layer, and part of medullary excipulum. h = hymenium, ie = inner ectal excipulum, me =


h
sh
me
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medullary excipulum, oe = outer ectal excipulum, sh = subhymenium, tr = trichodermium. Arrow indicates point at which the outer ectal excipular layer begins and above which the inner ectal excipulum flares out to form the margin.

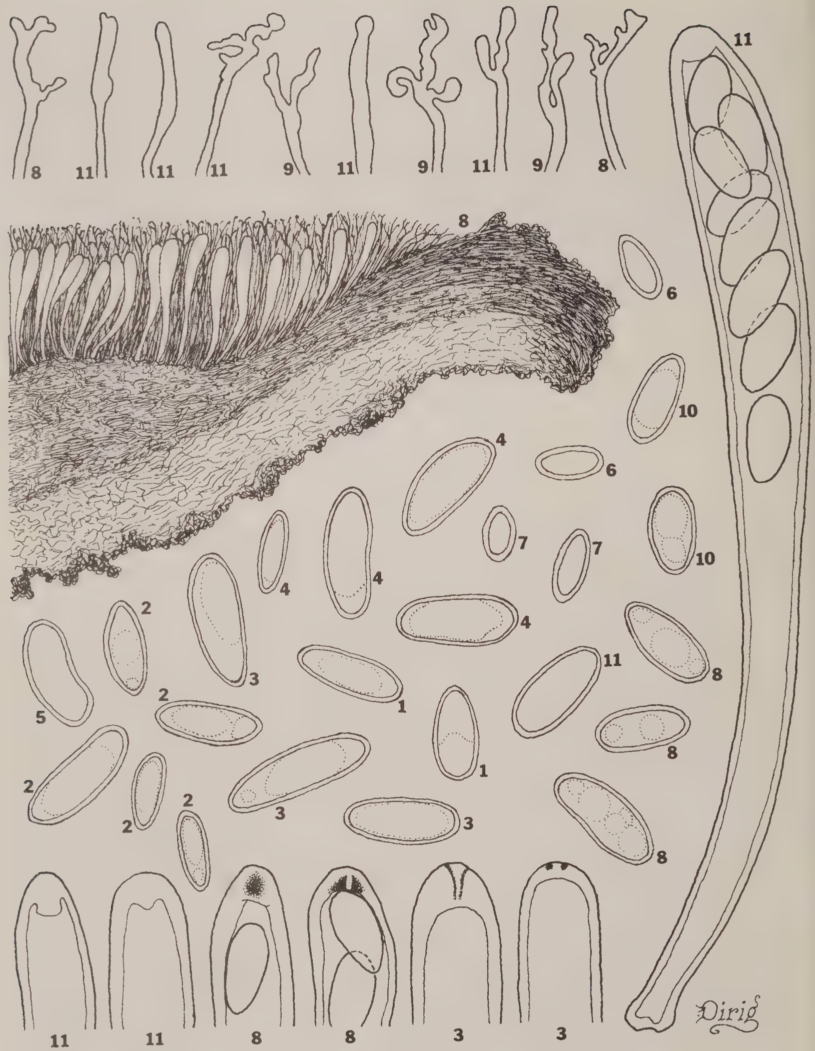
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PLATE 5. *Geocoryne variispora*. Section of apothecium × 100; paraphysis apices, loose ascospores, ascus, and ascus apices all × 1000. Ascus and two ascus apices at left rehydrated in water and mounted in Melzer's Reagent; four ascus apices at right rehydrated in 2% KOH mounted in Melzer's Reagent. Numbers refer to collections from which drawings were made: 1=CUP-MM 3; 2=MM 5; 3=MM 20; 4=MM 43; 5=MM 129; 6=MM 419; 7=MM 548; 8= MM 1139; 9=MM 1163; 10=MM 1208; 11=MM 1282.

Melzer's Reagent, but does blue when rehydrated in 2% or 10% aqueous KOH and then mounted in Melzer's Reagent, a phenomenon discussed earlier for a few other genera by Kohn and Korf (1975) and by Nannfeldt (1976). In the paratype species, *G. exogloea,* the pore blues faintly without KOH pretreatment, but the reaction is markedly enhanced by pretreatment with 10% KOH.

## *ACKNOWLEDGEMENTS*

Korf gratefully acknowledges the technical assistance of Susan C. Gruff and of Robert Dirig, and the financial assistance of National Science Foundation Grant DEB75-23557 which has supported the Macaronesian Discomycete Explorations. The courteous and welcome help of Prof. Wildpret de la Torre and Prof. Esperanza Beltrân Tejera of the Universidad de La Laguna, Tenerife made the visits there far more efficient for the senior author and his collector colleagues, Linda M. Kohn and Martha A. Sherwood, Cornell University, William C. Denison, Oregon State University, Robert Fogel, USDA Forestry Laboratory, Corvallis, Oregon, and Grégoire L. Hennebert, Université de Louvain, Belgium. The cooperation of various Norwegian scientists in arranging for the loan of all their discomycete collections from the Canary Islands is also deeply appreciated. Prof. William J. Dress, Bailey Hortorium, Cornell University, corrected the Latin diagnoses for *Geocoryne* and *G. variispora.* Singh and Tewari acknowledge their debt to Dr. L. R. Batra, USDA, Beltsville, for arranging for the Latin diagnosis of *G. exogloea* and for his helpful criticism; their research was financed in part by grant FG.-IN-331 by the USDA under PL.480 funds.

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# Taxonomy and Nomenclature of the Supraspecific Taxa of Porphyrellus[1]

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## *Abstract*

Taxonomic and nomenclatural revisions of the supraspecific taxa of *Porphyrellus* are presented in view of new data obtained from scanning electron microscopy studies of spores of the various type specimens. One new combination is proposed.

*Porphyrellus* was proposed as a genus by Gilbert (1931) and has since received summary treatments by Singer (1945, 1951, 1962, 1975). Smith & Thiers (1971) accepted *Porphyrellus* as a subgenus of *Tylopilus*. The purpose of this paper, however, is to examine taxonomically and nomenclaturally the supraspecific taxa within *Porphyrellus* rather than to present arguments in favor of either of the proposed ranks of the taxon.

When described by Gilbert (1931), *Porphyrellus* was diagnosed by smooth, red-brown to purple-brown spores. Singer (1945) later expanded the generic concept to include those taxa with "perforate-punctate" spores, i.e. section *Graciles*, typified by *P. gracilis* (Peck) Singer. Simultaneously, he described section *Tristes* with *P. tristis* (Patouillard & Baker) Singer as the nomenclatural type for the smooth spored taxa; this section included the type species of the genus, *P. porphyrosporus* (Fries in Fries & Hök) Gilbert. Singer (1962) later recognized that section *Tristes* was nomenclaturally superfluous to and taxonomically synonymous with the understood type section *Porphyrellus*. McNabb (1968) described a smooth-spored taxon, *P. viscidus*, from New Zealand, considering it intermediate between *Tylopilus* and *Porphyrellus*. It did not fit well into any of the sections available in *Porphyrellus*, however, so he proposed section *Pseudotylopili* with *P. viscidus* as the nomenclatural type. Singer (1962) described and validated (Singer, 1970) two subsections of *Graciles*, subsection *Gracilini* typified by *P. gracilis*

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[1] This paper represents contribution no. 489 from the Botanical Laboratories, University of Tennessee.

(Peck) Singer and subsection *Subflavidini* typified by *P. subflavidus* (Murrill) Singer. He also described as new (Singer, 1970) two subsections of section *Pseudotylopili*, subsection *Viscidini* typified by *P. viscidus* McNabb and subsection *Niveini* typified by *P. niveus* (G. Stevenson) McNabb. A summary of all these taxa is presented in Table I.

TABLE I

Infrageneric taxa of *Porphyrellus* as summarized by Singer (1975)

Porphyrellus *Gilbert* T: *P. porphyrosporus* (Fries in Fries & Hök) Gilbert

Section *Porphyrellus**

= Section *Tristes*[1] T: *P. tristis* (Pat. & Baker) Singer

Section *Pseudotylopili*[2] T: *P. viscidus* McNabb

  Subsection *Viscidini*[3] T: *P. viscidus* McNabb

  Subsection *Niveini*[4] T: *P. niveus* (G. Stevenson) McNabb

Section *Scrobiculati*[5] T: *P. conicus* (Rav. apud Berk. & Curtis) Singer

Section *Graciles*[6] T: *P. gracilis* (Peck) Singer

[= *Boletus* Subgenus *Austroboletus* Corner T: *B. dictyotus* (Boedijn) Corner[8]]

  Subsection *Gracilini** T: *P. gracilis* (Peck) Singer

  Subsection *Subflavidini*[7] T: *P. subflavidus* (Murr.) Singer

Recent studies (by CBW) using scanning electron microscopy have elucidated external spore morphology of the type specimen of the type species of some supraspecific taxa of *Porphyrellus*. As a result a reallignment of the taxonomy of the supraspecific taxa can be presented.

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*Taxa accepted without discussion.

[1-8] Superscripts refer to the order in which the taxa are discussed in the text.

Because Singer (1975) has presented the most comprehensive summary of these taxa, with authorities, the reader should refer to that publication during examination of the data below. It must be made perfectly clear that because light microscopy cannot resolve the detail of structure shown on SEM photomicrographs, previous reports and summaries of the taxa discussed here cannot be judged on data unobservable to their authors. Nevertheless, these taxa must be scrutinized for the sake of taxonomic accuracy and nomenclatural stability. Due to various methods of preservation and age of the specimens examined, spore quality may differ in the SEM's presented in this paper.

All specimens cited are listed at the close of the paper; herbaria abbreviations used in this paper are from Holmgren and Keuken (1974).

## OBSERVATIONS

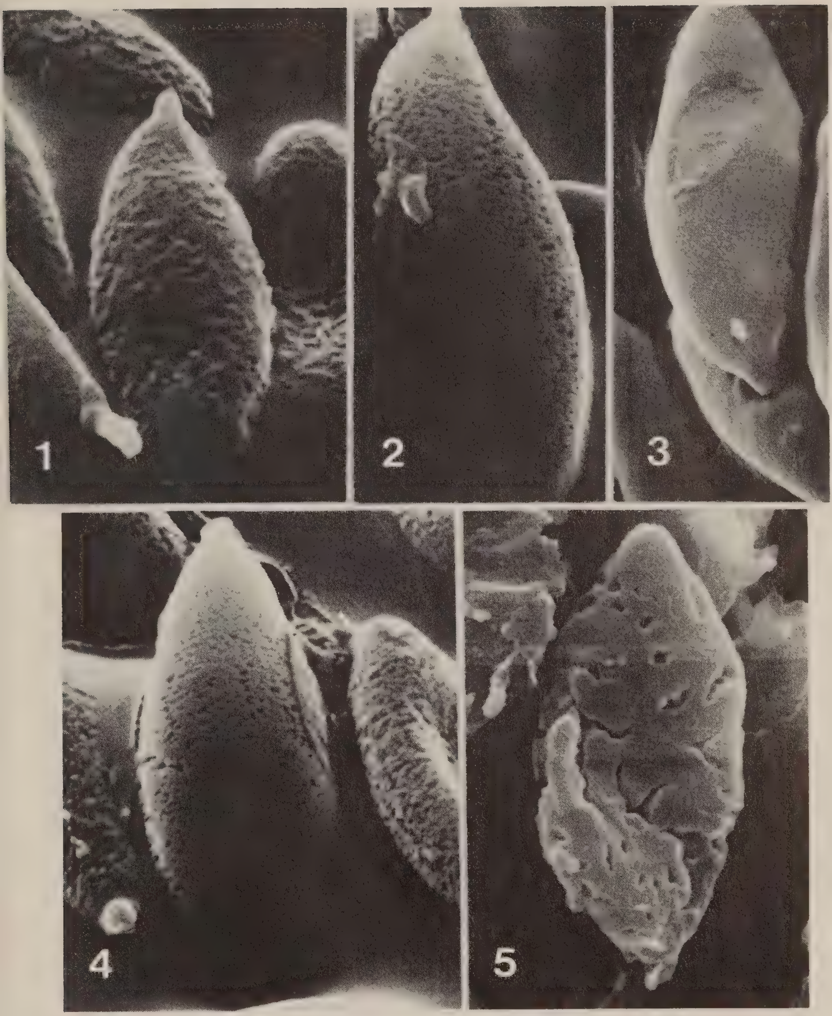
1. As originally proposed (Singer, 1945) section *Tristes* contained the type species of *Porphyrellus* (*P. porphyrosporus*), but its type species was designated as *P. tristis* (Pat. & Baker) Singer, the spores of which Singer described as "...slightly cloudy-punctulate with paler and darker brown zones..." SEM's of the spores of the type specimen of *P. tristis* (Fig. 1) show the spore wall clearly to be ornamented with complex ridges and shallow pits, probably the "paler and darker brown zones" of Singer. Corner (1972) in his redescription of *Boletus longipes* Massee indicated that it was an earlier synonym of *P. tristis*, with which we concur, based on spore morphology (Fig's. 2, 4) and other characters. Basionym of the correct name for the type species of the section *Tristes* therefore is *Boletus longipes* Massee.

2. The limits of section *Pseudotylopili* as proposed by McNabb (1968) are accepted. Spores of the type specimen of *P. viscidus* are smooth (Fig. 3).

3. Subsection *Viscidini* is diagnosed from the following subsection by having a smooth stipe (Singer, 1975)

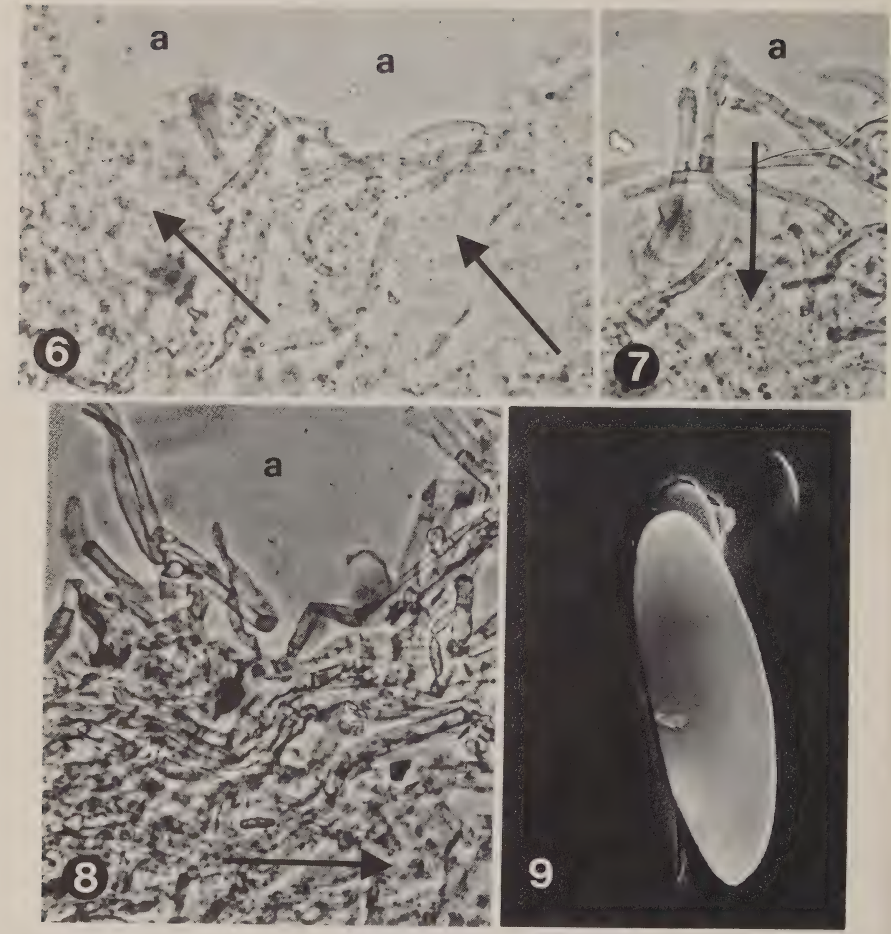
4. Subsection *Niveini* was circumscribed by Singer (1970) as showing viscid pileus, smooth spores, and "costate-reticulate-lacunose" stipe. SEM's of the spores of the type specimen of *P. niveus* (Fig's. 12, 13) show a punctulate, warted, spore surface with meandering ridges. The subsectional type species, therefore, violates the sectional circumscription; consequently the subsection must be removed from the section. See no. 7 below.

5. Section *Scrobiculati* was originally described by Singer (1945) within *Tylopilus*, but later (Singer, 1975) was transferred to *Porphyrellus*. Studies of the type specimen of *P. conicus* reveal the pileus cuticle as a gelatinizing trichodermium (Fig's. 6, 7, 8,) and the spores (Fig. 9) as



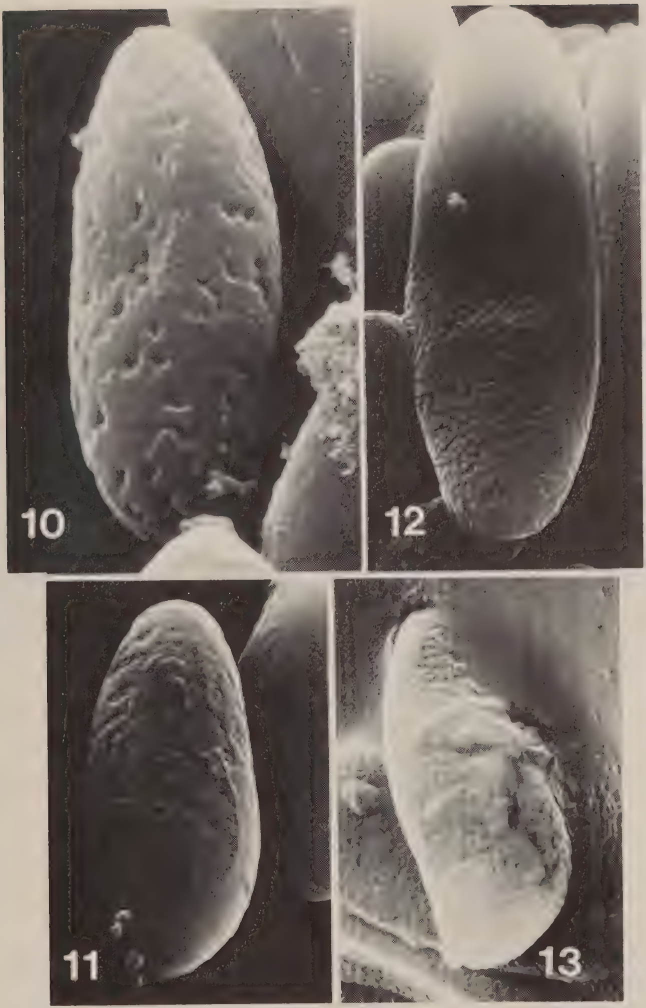
Fig's. 1-5. SEM's of *Porphyrellus* spores.

Fig. 1. *P. tristis*, X5640. Fig's. 2, 4. *P. longipes*, X6040.
Fig. 3. *P. viscidus* X6000. Fig. 5. *B. dictyotus*, X5934.



Fig's. 6-9. Photomicrographs and an SEM of *Porphyrellus*.

Fig's. 6, 7, 8. *P. conicus* trichodermium; gelatinizing elements (arrow); a = nontrichodermial areas; all X200. Fig. 9. *P. conicus* spore, X3144.



Fig's. 10-13. SEM's of *Porphyrellus* spores.

Fig's. 10, 11. *P. gracilis*, X5460, X3726. Fig's. 12, 13. *P. niveus*, X5600, X5360.

smooth. According to Singer (1945), the context reacts strongly to KOH.

6. The circumscription of section *Graciles* as proposed by Singer (1945) is accepted as including the "perforate-punctate" spore surface, and SEM's of the type specimen of *P. gracilis* (Fig's. 10. 11) show the spore ornamentation to be exactly so.

7. We accept the limits of subsection *Subflavidini* as established by Singer (1962, 1970, 1975). SEM's from an authentic Murrill specimen of *P. subflavidus* (Fig's. 14, 15, 16) show spores that are heavily punctate with broad meandering ridges. Grand & Moore (1971) presented data on *P. subflavidus* showing the same ornamentation pattern as presented here.

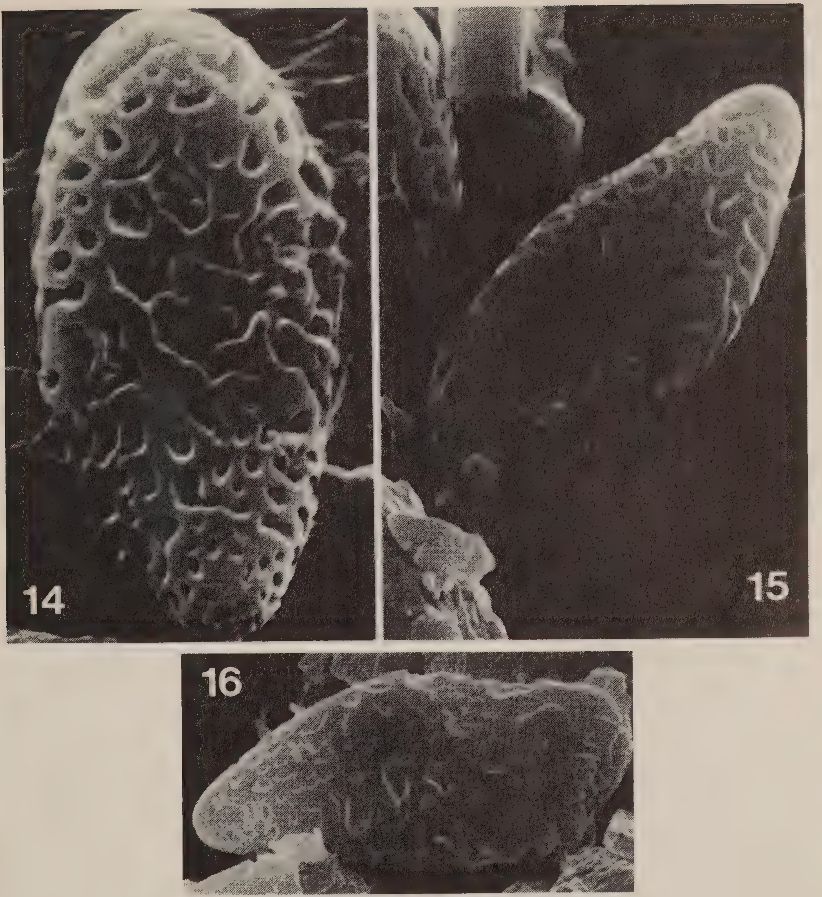
8. In describing *Boletus* subgenus *Austroboletus*, Corner (1972) indicated that it was taxonomically synonymous with *Porphyrellus* section *Graciles*. SEM's of the spores of the type specimen of *B. dictyotus* (Fig. 5) show the spores to be punctate with broad meandering ridges. Singer (1975) considered *Boletus* subgenus *Austroboletus* synonymous with the genus *Porphyrellus*.

## DISCUSSION

SEM studies of spore morphology of type specimens of the several type species of these supraspecific taxa have furnished data previously unreported. These data make some taxonomic and nomenclatural revisions necessary.

Section *Pseudotylopili* and its subsection *Viscidini* are taxonomically and nomenclaturally acceptable taxa as described by McNabb (1968) and Singer (1975). Typification of section *Pseudotylopili* subsection *Niveini* with *P. niveus* (which has warted, punctulate spores) violates the circumscription (smooth spores) of the section. *Porphyrellus niveus* belongs in section *Graciles* subsection *Subflavidini* on the basis of spore and fruitbody characters, and such a transfer of a type species renders subsection *Niveini* synonymous with section *Graciles* subsection *Subflavidini*.

Section *Tristes* would be synonymous with (and the name superfluous to) section *Porphyrellus* were it not for the rugulose-punctate nature of the spore surface. Because the spore and stipe characters of *P. tristis* fit the circumscription of section *Gracilis* subsection *Gracilini*, these two taxa are considered synonymous. *Boletus longipes* Massee is the basionym of the correct name of the type species of section *Tristes* (see above) and we propose the following new combination.



Fig's. 14-16. SEM's of *Porphyrellus* spores.

Fig's. 14, 15, 16. *P. subflavidus*, X6440, X5240, X3640.

*Porphyrellus longipes* (Massee) Wolfe & Petersen, comb. nov.

Basionym: *Boletus longipes* Massee. 1909. Kew Bull. (1909): 207.

= *Porphyrellus tristis* (Pat. & Baker) Singer. 1945. Farlowia 2: 118.

≡ *Boletus tristis* Patouillard & Baker. 1918. J. Straits Branch Roy. Asiatic Soc. 78: 70.

The nature of the cuticle and smooth spores of the type species of section *Scrobiculati* indicate this section as being closely related to section *Pseudotylopili*. The context reactivity to KOH and pileus surface are nevertheless sufficient to separate these two sections.

Because the sectional diagnostic characters of the type species of *Boletus* subgenus *Austroboletus* Corner and *Porphyrellus* section *Graciles* Singer are contaxic, we consider these supraspecific taxa to be synonymous.

A realligned taxonomic scheme is now proposed in light of the new data obtained from our studies of the types of supraspecific taxa of *Porphyrellus*, and is summarized in Table II.

## SPECIMENS EXAMINED

*P. conicus* (Rav. apud Berk. & Curtis) Singer: FH - "(2929); *Boletus conicus*; ad terram humidi in Pinetis, Julio 1849; Santee Canal, S.C.; Ravenel (1024)" Holotype.

*B. dictyotus* (Boedijn) Corner: BO - "Herb. Hort. Bot. Bog.; no. 15054; Boletaceae, *Boletus*, Vindplaats: Eiland, Java; Plaats; Tjiseureuh; 29.ix.1935" Holotype.

*P. gracilis* (Peck) Singer: NYS - "Coll. N.Y. State. Garrisons, Thurman, and Greig; Leg. C. H. Peck" Holotype.

*P. longipes* (Massee) Wolfe & Petersen: K - "Ex. Herb. Hort. Bot. Reg. Kew.; Ridley 81; Singapore" Herbarium sheet H345/77.1. Holotype.

*P. niveus* (G. Stevenson) McNabb: K - "Herb. Bot. Reg. Kew; Totaranui headland, New Zealand; 12.4.1955. G. Cone 978" Herbarium Greta Stevenson Cone. K. Herbarium sheet no. H2018.76.3. Holotype.

*P. subflavidus* (Murrill) Singer. NY - "Gainesville, Fla.; 7-11-38; Coll. & Det. West, Arnold, & Murrill" Authentic specimen; holotype specimen misplaced at FLAS.

*P. tristis* (Pat. & Baker) Singer: FH - "4995; *Boletus tristis*; Botanic Gardens, Singapore. Solitary among decaying leaves in jungle. C. F. Baker; Aug. '17" Holotype.

## TABLE II

Proposed taxonomic scheme
within *Porphyrellus*

*Porphyrellus* Gilbert. 1931. Les Bolets. Paris. p. 99. T: *P. porphyrosporus* (Fries in Fries & Hök) Gilbert.

- Section *Porphyrellus*. T: *P. porphyrosporus* (Fries in Fries & Hök) Gilbert.

- Section *Pseudotylopili* McNabb. 1968. N. Zealand J. Bot. 5: 546. T: *P. viscidus* McNabb.

  - Subsection *Viscidini* Singer. 1970. Fl. Neotropica Monog. 5: 19. T: *P. viscidus* McNabb.

- Section *Scrobiculati* (Singer) Singer. 1975. Agaricales in Modern Taxonomy p. 748. T: *P. conicus* (Rav. apud Berk. & Curtis) Singer.

- Section *Graciles* Singer. 1945. Farlowia 2: 119. T: *P. gracilis* (Peck) Singer.

- = *Boletus* subgenus *Austroboletus* Corner. 1972. Boletus in Malaysia p. 76. T: *B. dictyotus* (Boedijn) Corner.

  - Subsection *Gracilini* Singer. 1970. Fl. Neotropica Monog. 5: 22. T: *P. gracilis* (Peck) Singer.

  - = Section *Tristes* Singer. 1945. Farlowia 2: 115. T: *P. longipes* (Massee) Wolfe & Petersen. (= *P. tristis* (Pat. & Baker) Singer).

  - Subsection *Subflavidini* Singer. 1970. Fl. Neotropica Monog. 5: 20. T: *P. subflavidus* (Murr.) Singer.

  - = Section *Pseudotylopili* subsection *Niveini* Singer. 1970. Fl. Neotropica Monog. 5: 20. T: *P. niveus* (G. Stevenson) McNabb.

*P. viscidus* McNabb: PDD - "25185; scattered under *Leptospermum scoparium/ericoides*; Auckland, Kerikeri, Opito Bay; 16.v.1966; R. F. R. McNabb" Holotype.

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# PODONECTRIA, A GENUS IN THE PLEOSPORALES ON SCALE INSECTS

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## *SUMMARY*

The genus *Podonectria* occurs on scale insects and is characterized by fleshy, uniloculate ascocarps, abundant pseudoparaphyses, bitunicate asci and long, multiseptate ascospores. At present, eight species are included of which the type species, *P. coccicola,* is the most common. The associated anamorphic species have holoblastic staurospores and are placed in the sporodochial genus *Tetracrium* and the pycnidial genus *Tetranacrium.*

The genus *Podonectria* was erected by Petch (1921) and described as being nectriaceous, that is, like *Nectria. Nectria* belongs in the Euascomycetes, Hypocreales, characterized by bright-colored fruiting bodies and unitunicate asci. Although the ascocarps are light-colored, the lectotype species, *Podonectria coccicola,* has bitunicate asci and this genus belongs in the Pleosporales, Pleosporaceae, bearing only a superficial resemblance to members of the Hypocreales.

Petch (1921) included three species in *Podonectria: Podonectria coccicola, P. aurantii* and *P. echinata,* all occurring on scale insects. Dingley (1954) described *P. novae-zealandica* and *P. gahnia* on scale insects, including the genus in the Clavicipitaceae. *Podonectria tenuispora* was described by Dennis (1958) from England, also on scale insects. Petch (1927) described *Ophionectria coccorum* which was transferred to *Podonectria* by Rossman (1977). She also transferred *Lasiosphaeria larvaespora* to *Podonectria.* The genus currently contains eight species and is characterized by fleshy, white to brown, uniloculate ascocarps with bitunicate asci and long, multiseptate ascospores, occurring on scale insects.

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[1] Presently Anna E. Jenkins Postdoctoral Fellow.

*PODONECTRIA* Petch, Trans. Brit. Mycol. Soc. 7:146. 1921.

Ascocarps superficial in or on a scant to well-developed stroma, fleshy, white to brown, smooth, scurfy, with hairs or covered with an outer stroma, ostiolate, hairs, if present, developing as extensions of outer cells of ascocarp wall. Pseudoparaphyses numerous, reticulate, filiform. Asci bitunicate, long-clavate to cylindric, 8-spored. Ascospores long-clavate to cylindric, hyaline, multiseptate. Associated anamorphs: *Tetracrium* and *Tetranacrium* having holoblastic staurospores. On scale insects in tropical, rarely mild temperate, regions.

LECTOTYPE: *Podonectria coccicola* (Ellis & Everh.) Petch designated by Clements & Shear (1931) [as "*Podonectria coccophila* (Ellis & Everh.) Petch"].

*Podonectria* is related to *Puttemansia* P. Henn. and *Tubeufia* Penzig & Sacc., all having light-colored, fleshy ascocarps, bitunicate asci and multiseptate ascospores. *Podonectria* species occur on scale insects while species of *Puttemansia* are found on foliicolous fungi and have shorter ascospores which become only short-clavate to fusiform. Species of *Tubeufia* have long-clavate ascospores and are saprophytes on carbonous pyrenomycetes or well-rotted debris.

All the species included in *Podonectria* appear to be closely related, varying primarily in ascocarp ornamentation and ascospore length, with the exception of *Podonectria coccorum* and *P. gahnia*. These two species have brown ascocarps which form in or on a brown stroma and have narrow, cylindric ascospores.

Several *Tetracrium* species were described by Petch (1921) as the imperfect states of his *Podonectria* species. Although these anamorphs and the ascocarps are repeatedly collected together, Petch's claim has not been proven using pure culture isolation. These *Tetracrium* species and the related *Tetranacrium* pycnidia associated with *Podonectria gahnia* are regarded here only as associated anamorphic fungi.

Members of the genus *Podonectria*, particularly *P. coccicola*, may be important in the biological control of destructive scale insects on citrus trees. In their bulletin, Rolfs & Fawcett (1908, revised 1913) present a method for spreading several fungi throughout citrus orchards to control scale insects. The three species mentioned in the bulletin often occur together: *Ophionectria coccicola* (≡*Podonectria coccicola*), the white-headed fungus; *Sphaerostilbe coccophila*

(=*Nectria flammea*), the red-headed fungus; and *Myriangium duriaei*, the black fungus. In recent times this role has undoubtedly been usurped by chemical sprays.

## Key to Species of *Podonectria*

1. Ascocarps light-colored, fleshy, with pigmented outer wall or covered with superficial, pigmented scurf, which may be yellow to brown, rarely reddish, or covered with hairs; if present, stroma not brown; ascospores greater than 5 µm wide or, if less, then longer than 125 µm. 2
1. Ascocarps brown to dark-brown; stroma brown; ascospores generally less than 5 µm wide; if present, associated anamorph *Tetranacrium* with holoblastic staurospores enclosed in a pycnidium. 7

    2. Ascocarps smooth, at most covered with scurfy, pigmented granules which may be yellow to brown, rarely red; rarely with a few thick-walled hairs around ostiole; associated with sporodochial staurospores of *Tetracrium coccicolum*. 1. *Podonectria coccicola*
    2. Ascocarps with numerous hairs or hyphal covering. 3

3. Ascocarps subtended and covered with byssoid hyphae encrusted with bright-yellow granules. 2. *P. larvaespora*
3. Ascocarps with hyaline hairs or hyphal covering. 4

    4. Ascocarps covered with straight, hyaline hairs. 3. *P. novae-zealandica*
    4. Ascocarps covered with hyaline, flexuous hairs or with deltoid fascicles of hairs. 5

5. Ascocarps with deltoid fascicles of hyaline hairs; associated with sporodochial staurospores of *Tetracrium echinata*. 4. *P. echinatum*.
5. Ascocarps covered with flexuous hyphae, not aggregated into fascicles. 6

    6. Ascospores 55-85 x 7.5-12 µm; associated with *Tetracrium aurantii*; tropical. 5. *P. aurantii*
    6. Ascospores 125-150 x 3-7 µm; no known associated anamorph; temperate. 6. *P. tenuispora*

7. Ascocarps smooth or with a few, thick-walled, straight hairs around ostiole; ascospores 55-95 x 1.5-3 µm. 7. *P. coccorum*
7. Ascocarps enclosed in a well-developed, outer stroma with a layer of reddish-brown granules; ascospores 90-130 x 3.5-6 µm; associated pycnidial staurospores belonging to *Tetranacrium*. 8. *P. gahnia*

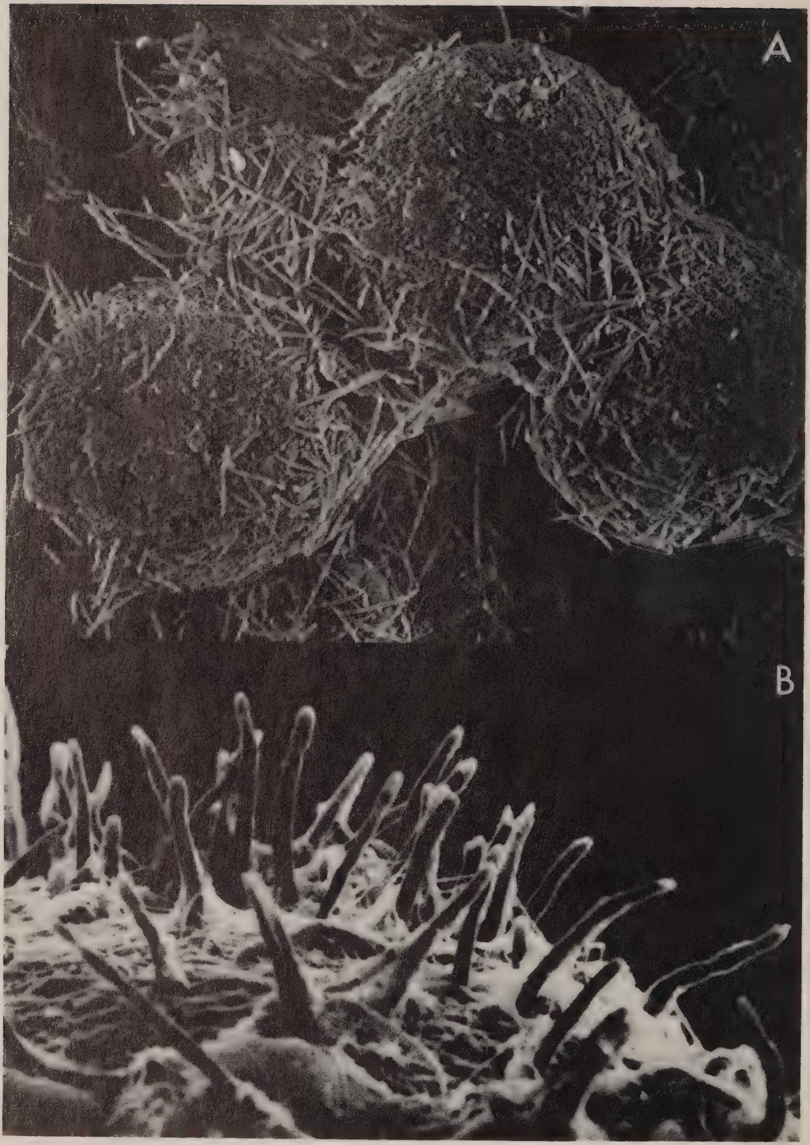


Fig. 1. A. *Podonectria coccicola* ascocarps and conidia of associated *Tetracrium coccicolum*. x100. B. *Podonectria novae-zealandica* hairs on ascocarp Holotype (PDD 10942). x550.

1. *Podonectria coccicola* (Ellis & Everh.) Petch, Trans. Brit. Mycol. Soc. 7:146. 1921. (Figs. 1A, 2, 3A-C)
   - ≡ *Nectria coccicola* Ellis & Everh., J. Mycol. 2:39. 1886.
   - ≡ *Ophionectria coccicola* (Ellis & Everh.) Berl. & Vogl., Add. Syll. Fung. p. 218. 1886.
   - ≡ *Dialonectria coccicola* (Ellis & Everh.) Ellis & Everh., J. Mycol. 2:137. 1886.
   - ≡ *Scoleconectria coccicola* (Ellis & Everh.) Seaver, Mycologia 1:198. 1909.
   - ≡ *Puttemansia coccicola* (Ellis & Everh.) Höhn., Sitzungsber. Kaiserl. Akad. Wiss., Math.-Naturwiss. Kl., Abt. 1, 120:408. 1911.
   - = *Scleroderris gigaspora* Massee, Kew Bull. 1910:3. 1910.

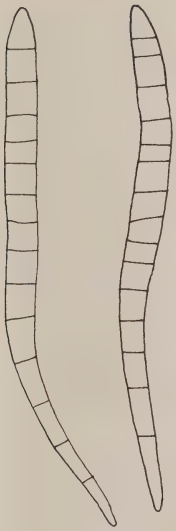


Fig. 2. Ascospores of *P. coccicola* x500.

Fruiting bodies solitary to densely gregarious, superficial on a white, byssoid stroma which often completely obscures the scale insect. Ascocarps obovate or globose to subglobose, 300-650 µm tall x 300-600 µm wide, flattened apically, smooth to scurfy, dirty-white to light-brown, often appearing darker due to patchy, granular scurf which may be yellow to brown, rarely red; rarely with thick-walled, hyaline hairs 25-60 x 10 µm, tips rounded, walls 1.5-2.5 µm thick; ostiole delimited by absence of granules, often depressed when dry, sometimes broad, up to 200 µm diam when ascocarp apex worn away; ascocarp wall 45-70 µm wide, composed of globose cells 6-10 µm diam forming textura angularis, cell walls 1-1.5 µm thick, cells of outer layer larger with thicker walls, sometimes pigmented. Pseudoparaphyses numerous, reticulate, filiform, 1-2 µm diam. Asci bitunicate, cylindric, 180-290 x 17-30 µm, ascospores parallel to spirally twisted toward base. Ascospores long-clavate, 110-190 x 7.5-9 µm, rounded apex tapering to a narrowly rounded base, vermiform, multiseptate, 13-21 septa per ascospore, forming cuboidal or subcuboidal to rectangular cells toward base, surface faintly verrucose.

Associated anamorph: *Tetracrium coccicolum* Höhn., Sitzungsber. Kaiserl. Akad. Wiss., Math.-Naturwiss. Kl., Abt. 1, 120: 408. 1911.

Sporodochial stroma white to cream, tough to cartilaginous, pulvinate, up to 800 µm wide and 500 µm tall, composed of hyaline cells, 5-20 µm diam forming textura epidermoidea in basal and central region but becoming textura angularis toward the margin; conidiophores moniliform, 20-30 x 4-7 µm, dilute yellow, sparsely branched, densely crowded on surface of stroma; conidia holoblastic staurospores, hyaline, 3-armed, rarely 4-5-armed; each arm long-fusiform with acute apex, 75-215 x 6-7.5 µm, multiseptate, 9-25 septa per arm, the middle arm usually longest; arms united at base by a globose cell, 2.5-5 µm diam, with truncate base where staurospores break off from conidiophore. The holotype specimen is the same as that of *Podonectria coccicola*.

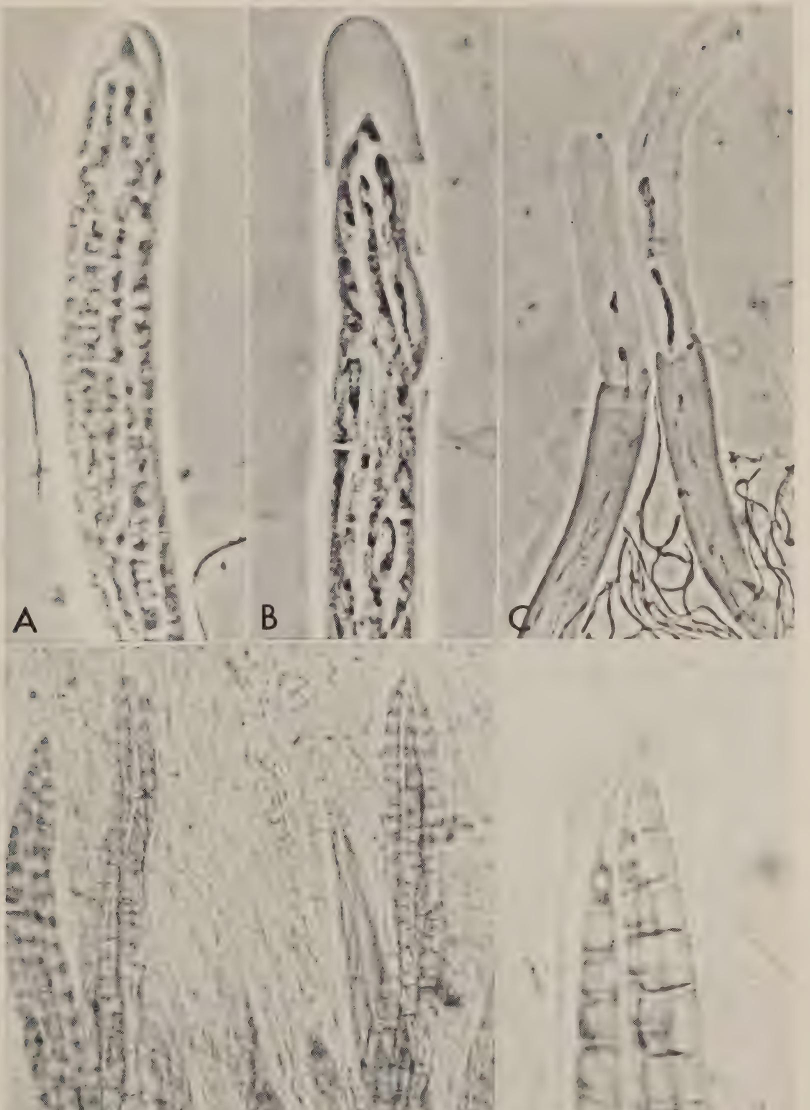
SUBSTRATE: On scale insects, known from *Aspidiotus ficus, A. perniciosus, Chionaspis citri, Lepidosaphes beckii, L. gloverii, Leucapsis* sp., *Mytilaspis citricola, M. gloverii, Parlatoria pergandii* and *P. zizyphi,* inhabiting citrus trees, *Citrus aurantii, C. nobilis, C. pomelanus* and *C. sinensis,* and other higher plants, *Brachyglottis repanda, Coprosma australis* and *Melicytus ramiflorus.*

DISTRIBUTION: Cosmopolitan in tropical and subtropical regions.

ILLUSTRATIONS: Dingley, Trans. & Proc. Roy. Soc. New Zealand 81:497 f. 3-5, 1954; Massee, Kew Bull. 1910:1 f. 1-5, 1910; Miyabe & Sawada, J. Coll. Agric. Tohoku Imp. Univ. 5:pl. 7 f. 11-16, 1913; Petch, Trans. Brit. Mycol. Soc. 7:pl. 4 f. 9, pl. 5 f. 1-3, 15, 1921; Pirozynski, Kew Bull. 31:602 f. 3A-3C, 1976; Rolfs & Fawcett, Florida Agric. Exp. Sta. Bull. 94: f. 6-14, 1908; Rolfs & Fawcett, Florida Agric. Exp. Sta. Bull. 119:f. 17-25, 1913; Tai & Wei, Sinensia 4:100 t. 28, 1933; Zimmerman, Centralbl. Bakteriol., 2 Abth. 7:874 f. 2, 1901.

HOLOTYPE: UNITED STATES, Florida, Brooksville, on scale insects on bark of living orange trees, Feb. 1886 (NY) Isotypes (BPI) (FH).

Fig. 3. A-C. *Podonectria coccicola* A. Ascus before rupture of outer wall. x470. B. Ascus in which the outer wall has ruptured with the extension of the inner wall. "Thimble" remains of outer wall on ascus apex are an artifact of rupture under a coverglass. x470. C. Asci in which the outer wall has ruptured with the extension of the inner wall and ascospores have been discharged. x415. D-E. *Podonectria larvaespora* Isotype (NY) D. Asci among pseudoparaphyses. x415. E. Apex of bitunicate ascus. x1160.


A
B
C
D
E

OTHER SPECIMENS EXAMINED: BRAZIL, Vicosa, Escola, A. S. Muller, 6 Oct. 1929 (BPI) (CUP-MG 47); Vicosa, Escola, A. S. Muller, 13 Oct. 1929 (BPI) (CUP-MG 53); Cantareira, E. de São Paulo, E. Ract., 27 May 1933, 914 (BPI). CEYLON, Glenugie, T. Petch, March, 1919 (FH). JAMAICA, intercepted at Philadelphia, Pennsylvania, C. G. Albrecht, 26 Dec. 1929, Philadelphia 10235 (BPI). NEW ZEALAND, Auckland, Puketi, J. M. Dingley, 20 June 1963 (PDD 23001); Auckland, Turangi, J. M. Dingley, Oct. 1949 (PDD 10947) (DAOM 46901); Auckland, Waitakere Ranges, Fairy Falls Track, J. M. Dingley, 1963 (PDD 21807). PERU, Tingo Maria, Janier Diegues, 26 June 1945 (BPI). PUERTO RICO, Espinoza, J. A. Stevenson, 25 Jan. 1917 (BPI); F. J. Seaver & C. E. Chardon 1064, 24 Jan.-4 Apr. 1923 (NY). REPUBLIC OF SOUTH AFRICA, Natal (Zululand), Eshowe, T. Parkins, June 1912 (PRE 2438). TRINIDAD, J. Rorer (FH Thaxter 1057). UNITED STATES, Florida, Brooksville, Dr. Martin, 15 March 1880 (FH) labelled *Nectria coccicola* authentic. This may be a paratype specimen on which the date has been miscopied, the 6 being mistaken for a 0, or the specimen may have been collected earlier but identified after Ellis and Everhart described the species; Florida, City Point, J. Bentel, Apr. 1904, ex USDA-BPI 1554 (B) (CUP 13632) (FH) (IARI) (MA) (NY); Florida, Gainesville, Bayer (FH Thaxter 5167); Florida, Lake Helen, 16 Feb. 1909 (HBG); Florida, Melbourne, J. Young, 28 June 1937 (NY); Florida, Monteverde, J. Franklin, Mar. 1890 (NY); Florida, Orlando, H. S. Fawcett, 12 Sept. 1908 (FH Thaxter 5340); Florida, Umatilla, C. L. Hopkins, 23 April 1891 (BPI); Florida, ex Herb. Ellis (FH Thaxter 401) (This may be another isotype); Louisiana, Plaquemines Co., Alliance, O. W. Barrett, 7 May 1907 (BPI); Mississippi, Ocean Springs, L. E. Miles 707, 12 June 1921 (BPI). VENEZUELA, Caracas, A. S. Muller, 15 Dec. 1937 (BPI) (CUP-VZ 2092).

The type specimen of *Scleroderris gigaspora* could not be located but the description and illustrations suggest that Petch (1921) was correct in placing this species in synonymy with *Podonectria coccicola*.

Two specimens from New Zealand (PDD 10947 & 21807) have ascocarps with purplish-red instead of the usual light- to dark-brown granules. In both specimens the species *Nectria flammea* with red-orange pigments in the ascocarp wall occurs on the same scale insects. The pigments in the fruiting bodies of both species turn purple in 2% KOH. The wall pigments of *Nectria flammea* have apparently become incorporated as granules into the outer layer of the ascocarps of *Podonectria coccicola* where they they appear purplish-red instead of red-orange.

2. *Podonectria larvaespora* (Cooke & Massee) Rossman, Mycologia 69:379. 1977. (Figs. 3D-E, 4A)
   ≡ *Lasiosphaeria larvaespora* Cooke & Massee, Grevillea 19:83. 1891.
   ≡ *Ophionectria larvaespora* (Cooke & Massee) Hansf., Proc. Linn. Soc. New South Wales 81:31. 1956.

Fruiting bodies solitary, partially immersed in a byssoid stroma; hyphae of stroma 3-5 µm diam, encrusted with bright-yellow granules, walls 1 µm thick. Ascocarps globose to obpyriform, 600-750 µm tall x 375-650 µm wide, light yellow-orange appearing bright-yellow due to loose covering of hyphae encrusted with bright-yellow granules, outer hyphal layer up to 50 µm thick; ostiole present; ascocarp wall 30-40 µm wide composed of globose cells 5-10 µm diam forming textura angularis, cell walls 1-1.5 µm thick becoming thicker in outer cell layer. Pseudoparaphyses numerous, reticulate, filiform, 1 µm diam. Asci bitunicate, cylindric, 240-295 x 25-32 µm, ascospores parallel to spirally twisted toward base. Ascospores long-clavate, 135-190 x 7.5-10 µm, rounded apex tapering to a narrowly rounded base, vermiform, multiseptate, 13-23 septa per ascospore forming cuboidal, subcuboidal to rectangular cells toward base.

SUBSTRATE: On scale insects inhabiting unidentified tree.

DISTRIBUTION: Known only from Australia.

ILLUSTRATIONS: Berlese, Icon. Fung. 1:t. 119 f. 1, 1894; Cooke, Handb. Austral. Fungi pl. 24 f. 220, 1892.

HOLOTYPE: AUSTRALIA, Victoria, Mt. Macedon, Martin 566 (K) Isotype (NY).

OTHER SPECIMEN EXAMINED: AUSTRALIA, Melbourne, ex Herb. Massee (NY).

*Podonectria larvaespora* differs from other species in the presence of bright-yellow hyphae forming a byssoid stroma which also covers the ascocarps and the lack of an associated *Tetracrium* anamorph. The ascospore size and shape are similar to that of *P. coccicola*.

3. *Podonectria novae-zealandica* Dingley, Trans. & Proc. Roy. Soc. New Zealand 81:496. 1954. (Figs. 1B & 4B)

Fruiting bodies solitary to aggregated in small groups, superficial on a pseudoparenchymatous stroma subtending the ascocarp and surrounded by a scant, white, byssoid stroma. Ascocarps broadly obpyriform or globose to subglobose, 450-600 µm tall x 500-560 μm wide, cream to light-yellow, with hairs; hairs hyaline, straight to slightly flexuous with rounded tips, 35-100 x 6-8.5 μm, sparsely septate, walls 2-2.5 μm thick; ostiole 40-50 μm diam; ascocarp wall 35-60 μm thick composed of unpigmented, globose cells 7-12 μm diam forming textura angularis, cell walls 1-2 μm thick, becoming 5 μm thick, slightly yellow in outermost layer. Pseudoparaphyses numerous, reticulate, filiform, 0.5-1 μm thick. Asci bitunicate, long-clavate to cylindric, 225-275 x 20-24 μm; ascospores long-clavate, 110-150 x 7.5-10 μm, apically rounded, tapering to narrowly rounded base, often slightly sigmoid to vermiform, multiseptate, 13-21 septa per ascospore forming cuboidal to subcuboidal cells.

SUBSTRATE: On scale insects, *Leucapsis* sp., inhabiting *Olearia rani*.

DISTRIBUTION: New Zealand. Known only from type locality.

ILLUSTRATIONS: Dingley, Trans. & Proc. Roy. Soc. New Zealand 81:497 f. 2a-b, 1954.

HOLOTYPE: NEW ZEALAND, Auckland, Hunua Range, on *Leucapsis* sp. on *Olearia rani,* J. M. Dingley, Oct. 1946 (PDD 10942).

The light-yellow ascocarps and lack of a *Tetracrium* associate suggest a relationship with *Podonectria tenuispora* from which *P. novae-zealandica* is distinguished by the wider ascospores and straight setae covering the ascocarps.

4. *Podonectria echinata* Petch, Trans. Brit. Mycol. Soc. 7: 151. 1921. (Fig. 4C)

Fruiting bodies scattered to aggregated in small groups, superficial on a scant, white, byssoid stroma. Ascocarps globose, 300-425 μm tall x 275-420 μm wide, light-yellow to yellow, covered with deltoid fascicles of hyaline hairs or solitary hairs; fascicles 70-100 μm at base by 110-180 μm long; hairs straight to flexuous, tips rounded, sparsely septate, 2.5 μm wide; ostiole 20-40 μm, conspicuous for lack of hairs; ascocarp wall 20-35 μm wide, composed of globose to to subglobose cells, slightly flattened parallel to wall, 4-10 μm diam, forming textura angularis, cell walls 1.5-2 μm thick, thicker and slightly pigmented toward outside of ascocarp. Pseudoparaphyses numerous, reticulate, filform, 1 μm diam. Asci bitunicate, long-clavate to broadly cylindric, 135-175 x 20-25 μm, ascospores slightly spirally twisted in asci. Ascospores long-clavate, 100-125 x 5-8 μm, apically rounded, tapering to a narrowly rounded base, vermiform,

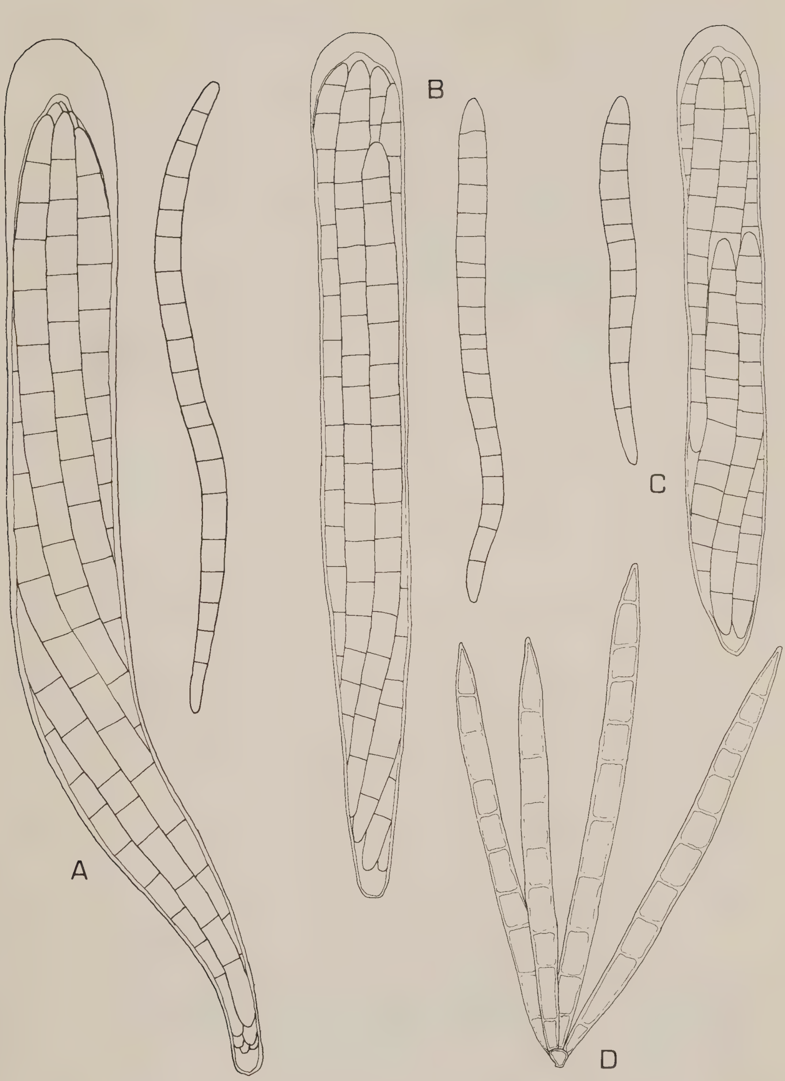


Fig. 4. A. *Podonectria larvaespora* ascus and ascospore Holotype (K). B. *P. novae-zealandica* ascus and ascospore Holotype (PDD 10942). C. *P. echinata* ascus and ascospore Holotype (K). D. *Tetracrium echinatum* conidium Holotype (K). All x500.

mulitseptate, 9-15 septa per ascospore forming cuboidal to subcuboidal cells.

Associated anamorph: *Tetracrium echinatum* Petch, Trans. Brit. Mycol. Soc. 7:162. 1921. (Fig. 4D)

Sporodochium pulvinate, 550-600 µm tall x 300-400 µm wide, orange to chestnut-brown; conidiophores moniliform, 20-30 x 4-7 µm, sparsely branching toward apex; conidia hyaline holoblastic staurospores composed of 3-4 arms; each arm long-fusiform with acute apex, 100-180 x 6-8 µm, multiseptate, 9-21 septa per arm; arms united at base by globose cell, 4-5 µm diam with truncate base where conidia break off conidiophore. Holotype specimen is the same as that of *Podonectria echinata*.

SUBSTRATE: On scale insects, *Lepidosaphes* sp., inhabiting *Citrus nobilis*.

DISTRIBUTION: Ceylon. Known only from type locality.

ILLUSTRATIONS: Petch, Trans. Brit. Mycol. Soc. 7:pl. 4 f. 7, 1921.

HOLOTYPE: CEYLON, Peradeniya, on *Lepidosaphes* sp. on pumelo, *Citrus nobilis*, Petch, Oct. 1919 (K).

This species is similar to *Podonectria aurantii* in centrum characters, ascocarp structure and associated anamorph. *P. echinata* is differentiated by the fascicles of hairs, although they are occasionally solitary, resembling those of *P. aurantii*, and longer, narrower ascospores.

5. *Podonectria aurantii* (Höhn.) Petch, Trans. Brit. Mycol. Soc. 7:149. 1921. (Figs. 5A-B)
≡ *Puttemansia aurantii* Höhn., Sitzungsber. Kaiserl. Akad. Wiss., Math.-Naturwiss. Kl., Abt. 1, 120:408. 1911 (ut *Puttemansia aurantii* (P. Henn.) Höhn.).
[≡ *Ophionectria aurantii* (Höhn.) Petch, Trans. Brit. Mycol. Soc. 7:151. 1921 *lapsus calami*.]
= *Ophionectria tetraspora* Miyabe & Sawada, J. Coll. Agric. Tohoku Imp. Univ. 5:85. 1913.

Fruiting bodies solitary to aggregated in small groups, superficial on a thick, white, byssoid stroma closely surrounding the ascocarps. Ascocarps globose to subglobose, 300-500 µm tall x 250-550 µm wide, light-yellow to brown, covered with flexuous hyphal hairs obscuring the outer wall; hairs hyaline, 40-150 x 3-6 µm, tips rounded, walls 1 µm thick, sparsely septate; ostiole 20-40 µm diam; ascocarp wall 35-50 µm thick

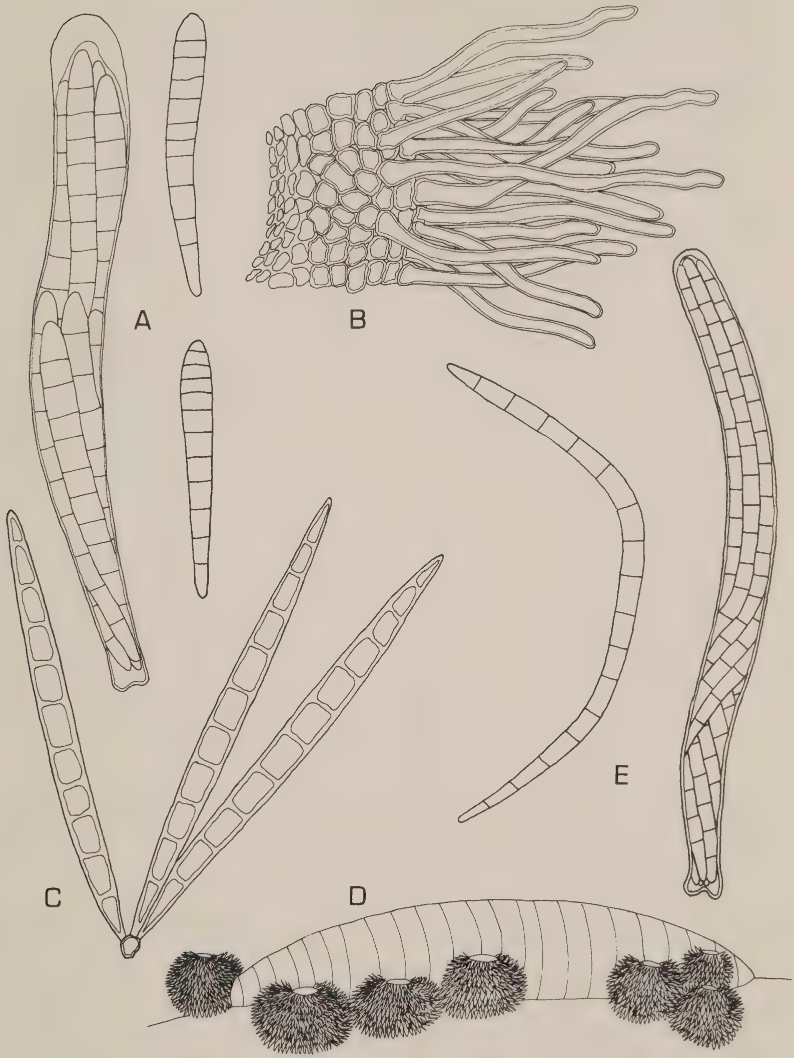


Fig. 5. A-B. *Podonectria aurantii* Holotype (B). A. Ascus and ascospores. B. Section of ascocarp wall with hairs. C. *Tetracrium aurantii* conidium Holotype (B). D-E. *Podonectria tenuispora* Holotype (K). D. Ascocarps on scale insect. E. Ascus and ascospore. All x500 except D which is x50.

composed of globose cells 5-7.5 μm diam forming textura angularis, cell walls 1-1.5 μm thick, outer layer of ascocarp cells pigmented below hyphal covering. Pseudoparaphyses numerous, reticulate, filiform, 0.5-1.5 μm diam. Asci bitunicate, long-clavate to cylindric, 150-200 x 17-20 μm; ascospores parallel in asci. Ascospores long-clavate, 55-85 x 7.5-12 μm, apically rounded, tapering to narrowly rounded base, multiseptate, 9-13 septa per ascospore forming cuboidal to subcuboidal cells.

Associated anamorph: *Tetracrium aurantii* P. Henn., Hedwigia 41:116. 1902. (Fig. 5C)

Sporodochia pulvinate to subglobose, 310-375 μm tall x 400-625 μm wide, yellow to yellow-orange; internally composed of small, thin-walled hyphae, 1-1.5 μm diam, forming loose textura intricata, outer layer 20-40 μm thick composed of textura angularis, cells pigmented, 4-10 μm diam, cell walls 1-1.5 μm thick; conidiophores densely aggregated on sporodochial surface developing from pigmented layer of textura angularis, moniliform, 40-60 x 4-7.5 μm, yellow, sparsely branched toward apex, cell walls slightly thickened; conidia hyaline holoblastic staurospores, mostly 4-armed, rarely 2-7-armed; each arm long-fusiform with acute apex, 125-180 x 6-9 μm, multiseptate, 9-21 septa per arm; arms united at base by globose cells 5-7.5 μm diam with truncate base where conidia break off from conidiophore, rarely with a second cell below basal cell. Holotype specimen is the same as that of *Podonectria aurantii*.

SUBSTRATE: On scale insects including *Parlatoria zizyphi* inhabiting *Citrus aurantium* and *C. nobilis*.

DISTRIBUTION: Brazil and Taiwan.

ILLUSTRATIONS: Miyabe & Sawada, J. Coll. Agric. Tohoku Imp. Univ. 5:pl. 7 f. 17-22, 1913; Petch, Trans. Brit. Mycol. Soc. 7:pl. 4 f. 10 & 14, 1921.

HOLOTYPE: BRAZIL, São Paulo, Horto Botanico, on insect larvae covering the twigs and branches of *Citrus aurantium* L., A. Puttemans 282, 26 June 1901 (B as *Tetracrium aurantii*). In addition, there are four slides and a fragmentary isotype specimen in the Höhnel collection at FH as an unpublished new combination in *Scoleconectria*.

OTHER SPECIMEN EXAMINED: TAIWAN, Tennaiho, Taihoku, on *Parlatoria zizyphi* (Lucas) Sign. infesting *Citrus nobilis* Lour., Y. Fujikuro, 11 Mar. 1911 (SAP) HOLOTYPE of *Ophionectria tetraspora*.

The type specimen of *Podonectria aurantii* was described as an imperfect fungus for which Hennings erected the genus *Tetracrium*. In examining Hennings's specimen, Höhnel discovered and described the perfect species *Puttemansia aurantii*. When Petch (1921) erected *Podonectria*, he transferred this species to his genus.

Petch (1921) considered *Ophionectria tetraspora* synonymous with *Podonectria aurantii*. Miyabe & Sawada (1913) recognized the relationship of their species to *Ophionectria coccicola* (≡*P. coccicola*).

*Podonectria aurantii* is similar to *P. coccicola, P. echinata* and *P. tenuispora* in centrum characters and ascocarp wall structure. It is differentiated by the dense layer of hyphae covering the ascocarp which Petch suggests is occasionally united into fascicles as in *P. echinata* and the ascospores which are shorter and wider than any other known *Podonectria* species.

6. *Podonectria tenuispora* Dennis, Kew Bull. 1957:404. 1958. (Figs. 5D-E)

Fruiting bodies solitary to aggregated in small groups, superficial with scant, white, byssoid stroma. Ascocarps globose to subglobose, 300-350 µm tall x 250-400 µm wide, translucent yellow to ochraceous yellow, densely covered with hyaline, flexuous hairs obscuring the outer wall; hairs 50-100 x 3-4 µm, sparsely septate, cell walls 1-1.5 µm thick becoming thinner at apex, tips bluntly rounded to slightly inflated; ostiole 75-100 µm wide; ascocarp wall composed of globose, unpigmented cells 3-5 µm diam forming textura angularis, cell walls 1-1.5 µm thick. Pseudoparaphyses scant to numerous, reticulate, filiform, 0.5-1.5 µm diam. Asci bitunicate, cylindric, 150-190 x 12-15 µm, ascospores parallel in young asci, becoming spirally twisted toward base at maturity. Ascospores long-cylindric, 125-150 or more x 3-7 µm, curved to vermiform, multiseptate, 15-17 or more septa per ascospore forming rectangular cells.

SUBSTRATE: On scale insects, *Lepidosaphes ulmi*, inhabiting *Calluna vulgaris*.

DISTRIBUTION: Scotland. Known only from type locality.

ILLUSTRATIONS: Dennis, Kew Bull. 1957:403 f. 4, 1958; Dennis, British Cup Fungi and Their Allies f. 19D, 1960; Dennis, British Ascomycetes f. 19D, 1968.

HOLOTYPE: SCOTLAND, West Inverness-shire, Camas na Togalach, Loch Morar, on scale insects, *Lepidosaphes ulmi* on *Calluna vulgaris*, R. W. G. Dennis, 13 July 1957 (K).

This species is the only temperate representative of *Podonectria*. Few mature ascospores were found so that the measurements may not be entirely representative of the species.

7. *Podonectria coccorum* (Petch) Rossman, Mycologia 69:379. 1977. (Fig. 6A)
    ≡ *Ophionectria coccorum* Petch, Trans. Brit. Mycol. Soc. 12:49. 1927.

Fruiting bodies solitary to aggregated, superficial on a dark, byssoid stroma which obscures the scale insect. Ascocarps globose to broadly ovoid, 180-300 µm diam, brown to dark-brown, scurfy due to shedding of dark, outer wall cells, sometimes with flexuous, thick-walled hairs around ostiole; hairs 17-25 x 5 µm, rarely intermixed with straight hairs, 100-125 x 9 µm; ascocarp wall 25-45 µm thick composed of globose to rectangular cells 3-8 µm diam with walls 1-1.5 µm thick, forming textura angularis, becoming textura globulosa in pigmented outer layer. Pseudoparaphyses numerous, reticulate, filiform, 0.5-1 µm thick. Asci bitunicate, cylindric, 85-110 x 7.5-9 µm; ascospores parallel to slightly twisted. Ascospores cylindric, 55-95 x 1.5-3 µm, straight to slightly sigmoid, multiseptate, 5-9 septa per ascospore forming rectangular cells, hyaline, becoming dilute brown at maturity.

SUBSTRATE: On scale insects, *Fiorinia juniperi,* inhabiting *Juniperus bermudiana*.

DISTRIBUTION: Ceylon.

ILLUSTRATION: Petch, Trans. Brit. Mycol. Soc. 12:pl. 8 f. 6-10, 1927.

HOLOTYPE: CEYLON, Peradeniya, Royal Botanic Gardens, on *Fiorinia juniperi* Green on *Juniperus bermudiana*, E. E. Green, Petch 3172, 1910 (K).

OTHER SPECIMEN EXAMINED: CEYLON, Peradeniya, Petch, 1 Nov. 1923 (FH).

*Podonectria coccorum* is an unusual member of the genus. The dark ascocarps, small asci and small, narrow ascospores which become dilute brown are not typical of *Podonectria* species but do suggest a relationship with *P. gahnia*, the other anomalous member of this genus.

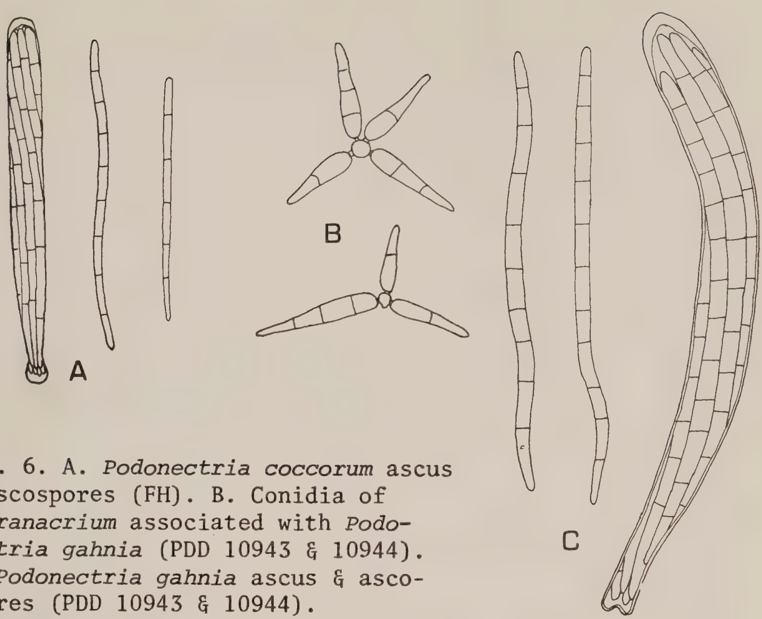


Fig. 6. A. *Podonectria coccorum* ascus & ascospores (FH). B. Conidia of *Tetranacrium* associated with *Podonectria gahnia* (PDD 10943 & 10944). C. *Podonectria gahnia* ascus & ascospores (PDD 10943 & 10944). All x 500.

When Petch (1927) described this species, he mentioned two associated imperfect species: *Peziotrichum lachnella* (Sacc.) Lind. and *Volutella epicoccum* Petch. Because these species have no apparent relationship to the other imperfect fungi associated with *Podonectria* species, the relationship between *Podonectria coccorum* and these associated fungi remains tenuous. *Peziotrichum lachnellum* is known to occur on living leaves, not necessarily associated with scale insects. Unrelated fungal species are occasionally found on the same scale insect.

8. *Podonectria gahnia* Dingley, Trans. & Proc. Roy. Soc. New Zealand 81:498. 1954. (Fig. 6C)

Fruiting bodies gregarious, each immersed in a well-developed outer stroma; stroma dark-brown, 40-80 μm thick composed of globose cells 3-12 μm diam with walls 2-5 μm thick, forming textura angularis, enclosing a layer, up to 50 μm thick, of large, reddish-brown, water-soluble granules. Ascocarps globose to subglobose, 270-390 μm tall x 190-310 μm wide, brown to dark-brown, surrounded by outer stroma; ostiole sunken, 20-40 μm diam; ascocarp wall 20-35 μm thick, composed of elongated cells with thin to slightly thickened walls 0.5-

1.5 µm thick forming textura prismatica, becoming globose and pigmented toward outside. Pseudoparaphyses numerous, reticulate, filiform, 1-1.5 µm diam. Asci bitunicate, long-clavate to cylindric, 135-190 x 12-18 µm; ascospores parallel in asci. Ascospores long-clavate to cylindric, 90-130 x 3.5-6 µm, tapering to rounded ends, slightly curved to vermiform, multiseptate, 9-11 septa per ascospore forming rectangular cells.

Associated anamorph: *Tetranacrium* sp. (Fig. 6B)

Pycnidia appearing similar to ascocarps of *Podonectria gahnia* but more irregular in shape, somewhat involuted and eventually open; immersed in dark-brown, outer stroma with ascocarps; conidiophores moniliform forming dense layer lining the base and sides of pycnidium; conidia hyaline holoblastic staurospores, 3-4 armed; each arm clavate, widest toward point of attachment, 20-40 x 5-6 µm, 1-3 septa per arm; arms united at base by a globose cell 3-4 µm diam, truncate where conidia break off from conidiophore.

SUBSTRATE: On scale insects including diaspid, mostly unidentified insects, inhabiting *Gahnia setifolia, G. xanthocarpa* and *Podocarpus ferrugineus.*

DISTRIBUTION: New Zealand.

ILLUSTRATIONS: Dingley, Trans. & Proc. Roy. Soc. New Zealand 81:497 f. 1a-b, 1954.

HOLOTYPE: NEW ZEALAND, Auckland, Waitakere Ranges, Simla Rd., 1000 ft., on diaspid scale on *Gahnia setifolia,* J. M. Dingey, 19 Oct. 1947 (PDD 19045).

OTHER SPECIMENS EXAMINED: NEW ZEALAND, Auckland, Omahuts Forest, Sanctuary Reserve, J. M. Dingley, 19 June 1963 (PDD 23868); Auckland, Waitakere Ranges, Sharp's Bush, J. M. Dingley, 13 Oct. 1965 (PDD 24775); Auckland, Waitakere Ranges, J. M. Dingley, Nov. 1948 (PDD 10943); Auckland, Swanson, J. M. Dingley, Nov. 1945 (PDD 10944); Wellington, Kaitohe, A. H. Healy, April 1953 (PDD 12753).

The peculiar outer stroma surrounding the ascocarps distinguishes *Podonectria gahnia*, related to *P. coccorum* in having brown ascocarps and small, narrow ascospores. Despite the formation of pycnidia, the shape and development of the conidia of the associated *Tetranacrium* suggest a relationship to *Tetracrium*, the anamorph associated with several *Podonectria* species. *Tetranacrium* was descrbed with one species, *T. gramineum,* immersed in dead leaves of *Saccharum officinarum* and *Sorghum vulgarum* (Hudson & Sutton, 1964). The peculiar imperfect fungus associated with *Podonectria gahnia* belongs in *Tetranacrium*.

## Excluded species

*Podonectria bambusicola* (Rehm) Pirozynski, Kew Bull. 31:603. 1976.

*Trichonectria bambusicola* Rehm, a later synonym of *Ophionectria erinacea* Rehm (Rossman, 1977), was transferred to *Podonectria* on the basis of the bitunicate asci, multiseptate ascospores and *Tetracrium* associated anamorph. It occurs on living leaves of bamboo rather than scale insects and remains a loculoascomycete of uncertain disposition.

## Acknowledgements

The curators and their assistants at the following herbaria are sincerely acknowledged for the generous loan of specimens: B, BPI, CUP, DAOM, FH, HBG, IARI, K, NY, PDD and SAP. This project was initiated while visiting the New York Botanical Garden in 1971 as the recipient of the Gertrude S. Burlingham Scholarship and continued at Oregon State University, Department of Botany. I am particularly grateful to Dr. William C. Denison for his unfailing support and encouragement.

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## ADDENDUM

While this paper was in press, two additional species recently placed in *Podonectria* came to the attention of the author. Their type specimens will be examined and evaluated in a later publication.

Kobayasi, Y. & D. Shimizu. 1977. Two new species of *Podonectria* (Clavicipitaceae). Bull. Natl. Sci. Mus., Ser. B (Bot.) 3:93-97.

MYCOTAXON

Vol. VII, No. 1, p. 183 April-June 1978

# NOTICE

## RESULTS OF THE POLL TAKEN OF MYCOTAXON SUBSCRIBERS

Along with the subscription renewal notice for volume 6, the Co-Editors of MYCOTAXON included a small questionnaire designed to determine the sentiments of subscribers concerning editorial policies, in particular those policies relating to long articles.

In establishing the journal, the Co-Editors were (i) anxious to avoid imposing page charges on authors (or their institutions), and were (ii) willing to accept articles of any length. In the first six volumes, the articles have ranged from one page to 277 pages in length, averaging about 15 pages per article.

The Co-Editors began to worry what might happen if we were flooded with several book-length manuscripts. No volume, even in the expanded "at least 512 pages" size now in force, has ever run more than 3 quarterly issues, and three volumes were completed in two issues. A series of book-length manuscripts might find us producing more than two volumes in a year, which at the current subscription rates ($12 or $14 per volume for personal subscriptions) might prove a burden to our subscribers beyond their financial resources.

We suggested one possible solution in our questionnaire: imposition of an excess page charge beyond a "free" allowance for long articles (or for articles by the same author with pages beyond such a "free" allowance in one year). These excess pages would allow expanding the size of the journal beyond the "at least 512 pages" budgeted, without any additional cost to subscribers for the extra pages in such a volume.

We have had many, many comments and thoughtful suggestions from our subscribers. All these have been weighed in our thinking. We are pleased to report that a substantially large number of subscribers do not wish to change the present policy. We will, therefore, continue as we have done in the past. There has been no flood of book-length papers submitted. Those that have been are of high quality, even though of course not of universal interest. Were such monographs published instead as separate books, or in a separate monograph series with fewer subscribers, the cost per monograph would increase drastically.

One editorial change seems appropriate: we shall ask authors planning on long papers, in excess of 50 pages, to provide us sample pages of their manuscripts before proceeding to final typing, so that we may offer advice on ways to save space in publishing the material.

The Co-Editors wish to express their deep appreciation for the time and effort taken by those subscribers who answered our query, and particularly for the valuable comments so many of them provided. On the basis of these we are convinced that we are accomplishing what we set out to do. We want to assure subscribers that we are open at any time for suggestions on improving the journal to make it more responsive to our readers' needs and desires.

MYCOTAXON

Vol. VII, No. 1, p. 184 April-June 1978

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*AN INTERNATIONAL JOURNAL DESIGNED TO EXPEDITE PUBLICATION OF RESEARCH ON TAXONOMY & NOMENCLATURE OF FUNGI & LICHENS*

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MYCOTAXON

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# DISCOMYCETES EXSICCATI, FASC. II & III

RICHARD P. KORF AND SUSAN C. GRUFF

*Plant Pathology Herbarium, Cornell University*
*Ithaca, New York 14853 USA*

It was nearly a quarter century ago that the first fascicle of this set of dried Discomycete specimens was issued (Korf, 1955). It has not been a lack of specimens to issue that has caused this delay, but rather a realization that in many cases the basic taxonomy was incomplete. Moreover, the status of nomenclature was so unfortunate that the names available could scarcely stand the test of time. Several abortive attempts were made by the senior author to prepare additional fascicles for issue: each time he was held back by unanswered questions and doubts.

In the ensuing years the nomenclature of generic names in the Pezizales was clarified by the work of a former student, Joanne K. Rogers, and by the publications of many colleagues, to the point where there are now few grey areas. In the Helotiales, work in the Sclerotiniaceae by another former student, K. P. Dumont, has brought us closer to an understanding of generic limits, and to a sounder nomenclature. Other groups of the Inoperculate Discomycetes are still in some disarray, but certainly the picture today is much brighter than it was when the exsiccati set was planned.

The title of the set has been changed slightly. Two additional herbaria now receive sets in addition to the eleven listed by Korf (1955), *viz.*, BP = Museum of Natural History, Budapest, and FH = Farlow Herbarium, Harvard University, Cambridge. Susan C. Gruff joins Korf as an editor.

Three new combinations are proposed here for species of *Rutstroemia* Karst. *sensu* White: (38) Lanzia longipes (Cke. & Peck *in* Cke.) Dumont & Korf, *comb. nov.* (basionym: *Peziza longipes* Cke. & Peck *in* Cke., Bull. Buffalo Soc. Nat. Sci. 1: 295. 1875); (39) Lanzia luteo-virescens (Rob. *in* Desmaz.) Dumont & Korf, *comb. nov.* (basionym: *Peziza luteo-virescens* Rob. *in* Desmaz., Pl. crypt. France, fasc. 31, *1541*. 1846); (46) Poculum petiolorum (Rob. *in* Desmaz.) Dumont & Korf, *comb. nov.* (basionym: *Peziza petiolorum* Rob. *in* Desmaz., Pl. crypt. France, fasc. 24, *1158.* 1842).

We are particularly happy to be able to issue many collections of historical interest made by earlier Cornell Discomycete workers, Elias J. Durand, Herbert H. Whetzel, W. Lawrence White, etc. In these two fascicles we issue type and authentic materials of several kinds. The holotype materials in CUP that are distributed become isotypes in other herbaria:

ISOTYPES: (26) *Botryotinia calthae,* (33) *Lambertella hicoriae* (issued as *L. corni-maris*), (34) *Lambertella jasmini,* (37) *Coprotinia minutula* (issued as *Lambertella minutula*), (40) *Martininia panamaensis,* (48) *Septotinia podophyllina,* (49) *Sclerotinia smilacinae* (issued as *Stromatinia rapulum*), (50) *Verpatinia calthicola,* and (65) *Jafnea imaii* (issued as *Jafneadelphus ferrugineus* ssp. *imaii*).

ISOPARATYPES: (35) *Lambertella pallidispora* (issued as *L. microspora*), (44) *Sclerotinia longisclerotialis* (issued as *Myriosclerotinia longisclerotialis*).

TOPOTYPE: (47) *Sclerotinia geranii* (issued as *Seaverinia geranii*).

AUTHENTIC: (29) *Ciboria acerina*, (47) *Sclerotinia geranii.*

Taxonomic notes also appear on some of the labels: (36) on an abberrant collection of *Lambertella ? microspora,* (37) on "hairs" in *L. minutula,* (49) on host misidentification of *Sclerotinia smilacinae* and on the date of publication of the combination *Stromatinia rapulum,* (53) on synonymy of *Byssonectria aggregata* and *B. fusispora,* (57) on Korf's previous error in reporting no gel layer in the excipulum of *Cookeina* spp., and (70) on the possible validity of *Geneosperma* as a genus distinct from *Scutellinia.*

## *ACKNOWLEDGEMENTS*

The senior author acknowledges that were it not for the willingness of Susan C. Gruff to assume a major share of the task of issuing these sets, they would still remain awaiting action. We thank the many collectors whose names appear on the labels. Many of the collections were made by the senior author when he was supported by a Cornell University Faculty Research Grant, by the United States Educational (Fulbright) Commission in Japan, and particularly by the research grants awarded him by the National Science Foundation: G-9041 (Discomycete Flora of Asia), G-2339 (Monographic Studies of the Discomycetes), GB-8548 (Monographic and Floristic Studies of the Discomycetes), and DEB75-23557 (Discomycetes of Macaronesia). We are indebted, too, to the curators of herbaria that have lent us specimens used in reaching our taxonomic decisions on the specimens issued here.

## DISCOMYCETES EXSICCATI

DEPARTMENT OF PLANT PATHOLOGY, CORNELL UNIVERSITY
RICHARD P. KORF & SUSAN C. GRUFF, EDITORS

26. *Botryotinia calthae* Hennebert & Elliott *in* Hennebert & Groves, Canad. J. Bot. 41: 343. 1963. ISOTYPE

In swamp, on sclerotia developed in last year's petioles and leaf veins of *Caltha palustris*.

Michigan Hollow, Danby, New York.

Leg: G.L.Hennebert (3094), R.P.K. & students 14.V.1962
Det: G.L.Hennebert

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## DISCOMYCETES EXSICCATI

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27. *Botryotinia squamosa* Viennot-Bourgin, Ann. Inst. Natl. Rech. Agron., Sér. C, Ann. Épiphyt. 4: 38. 1953.

Apothecia produced in growth chamber.

Cornell University, Ithaca, New York.

Leg: R.R.Bergquist 24.V.1967
Det: R.R.B.

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## DISCOMYCETES EXSICCATI

DEPARTMENT OF PLANT PATHOLOGY, CORNELL UNIVERSITY
RICHARD P. KORF & SUSAN C. GRUFF, EDITORS

28. *Botryotinia squamosa* Viennot-Bourgin, Ann. Inst. Natl. Rech. Agron., Sér. C, Ann. Épiphyt. 4: 38. 1953.

Apothecia produced on wheat medium transferred to sterile sand in a growth chamber. Isolated from onion transplants sent from Texas, grown on Long Island, New York.

Cornell University, Ithaca, New York.

Leg: R.R.Bergquist 12.XII.1966
Det: R.R.B.

## DISCOMYCETES EXSICCATI

DEPARTMENT OF PLANT PATHOLOGY, CORNELL UNIVERSITY
RICHARD P. KORF & SUSAN C. GRUFF, EDITORS

29. *Ciboria acerina* Whetzel & Buchwald *in* Groves & Elliott, Canad. J. Bot. 39: 217. 1961. AUTHENTIC

On overwintered male aments of *Acer saccharinum.*

North of Bailey Hall, Cornell University, Ithaca, New York.

Leg: H.H.Whetzel (S1046) *& al.* 5.IV.1934
Det: H.H.W.

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## DISCOMYCETES EXSICCATI

DEPARTMENT OF PLANT PATHOLOGY, CORNELL UNIVERSITY
RICHARD P. KORF & SUSAN C. GRUFF, EDITORS

30. *Ciboria bolaris* (Batsch *ex* Pers. : Fr.) Fuckel, Jahrb. Nassauischen Vereins Naturk. 23-24: 311. 1870.

On twigs of *Carpinus caroliniana.*

Near mouth of Enfield Gorge, Enfield, New York.

Leg: H.H.Whetzel (S557) & C.Westcott 4.V.1928
Det: H.H.W.

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## DISCOMYCETES EXSICCATI

DEPARTMENT OF PLANT PATHOLOGY, CORNELL UNIVERSITY
RICHARD P. KORF & SUSAN C. GRUFF, EDITORS

31. *Ciboria peckiana* (Cooke) Korf f. *peckiana*, Phytologia 21: 203. 1971 [≡ *Rutstroemia macrospora* (Peck) Kan. *in* Wehm. f. *macrospora*].

On very hard wood of a fallen tree.

Slopes of Mt. Gedeh, 1500-1850 m elev., Tjibodas, Java.

Leg: M.A.Rifai & R.P.K. 17.XII.1961
Det: R.P.K.

## DISCOMYCETES EXSICCATI

DEPARTMENT OF PLANT PATHOLOGY, CORNELL UNIVERSITY
RICHARD P. KORF & SUSAN C. GRUFF, EDITORS

32. *Lambertella corni-maris* von Höhnel, Sitzungsber. Kaiserl. Akad. Wiss., Math.-Naturwiss. Kl., Abt. 1, 127: 375. 1918.

a. On potato-dextrose agar. Cornell University, Ithaca, New York. 1937-1939.
b. On artificially inoculated fruits of *Cornus mas*. XII.1937-III.1938.

From culture sent to Whetzel in 1933 by T.N.Harrison, isolated VIII 1931 from apple collected by T.N.H. near Brig, Switzerland.

Leg: H.H.Whetzel (S1010)
Det: H.H.W.

## DISCOMYCETES EXSICCATI

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33. *Lambertella corni-maris* von Höhnel, Sitzungsber. Kaiserl. Akad. Wiss., Math.-Naturwiss. Kl., Abt. 1, 127: 375. 1918 [ISOTYPE of *L. hicoriae* Whetz., Lloydia 6: 33. 1943, *nom. subnud.*].

a. On stromatised hulls of *Carya ovata*.

Wood along east shore, Cayuta Lake, New York.

b. On potato-dextrose agar (harvested 4.III.1939).

Leg: H.H.Whetzel (S1393), W.L.White *& al.* 9.IX.1938
Det: K.P.Dumont

## DISCOMYCETES EXSICCATI

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34. *Lambertella jasmini* Seaver, Whetzel & Dumont *in* Dumont, Mem. New York Bot. Gard. 22: 75. 1971. ISOTYPE

On potato-dextrose agar, from fruits of *Jasminum gracile*. Collected by J.M.Waterston in Walsingham, Bermuda, 18.VII. 1941.

Cornell University, Ithaca, New York.

Leg: H.H.Whetzel (S1480) 31.III.1942
Det: H.H.W.

## Discomycetes Exsiccati

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35. *Lambertella microspora* (Seaver) Dumont, Mycologia 66: 1040. 1974. [= *L. pallidispora* Dumont, Mem. New York Bot. Gard. 22: 112. 1971. ISOPARATYPE]

On sheathing base of a palm frond.

Inland from west bank of Rio Mamoré, Bolivia, across river from Abuná, Brazil.

Leg: K.P.Dumont (388), G.T.Prance, L.G.Farias & L.F.Coelho 9.VII.1968
Det: K.P.D.

## Discomycetes Exsiccati

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36. *Lambertella ? microspora* (Seaver) Dumont, Mycologia 66: 1040. 1974.

On leaf blades of *Turpinia formosana*.

Along Bai-bue-tze River, Experimental Forest, Ta-Shui-Che, Chin-Shui-Kou, Taiwan.

NOTES: Dumont (Mem. New York Bot. Gard. 22: 117. 1971) reported this species (as *L. pallidispora* Dumont) from the Philippines. This collection differs somewhat in the lack of distinctive hairs and the enlarged excipular cells recalling *Moellerodiscus*. K.P.D. & R.P.K.

Leg: R.P.K., K.P.Dumont & K.C.Wang 28.III.1966
Det: K.P.D.

## Discomycetes Exsiccati

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37. *Lambertella minutula* (Whetzel) Dumont, Mycologia 67: 320. 1975. ISOTYPE [≡ *Coprotinia minutula* Whetz.]

On dung of some animal.

Woods about north bog, Malloryville, New York.

NOTES: What Dumont *(loc. cit.)* calls "apically free cells" I would term "thick-walled hairs with oily contents." R.P.K.

Leg: H.H.Whetzel (S1538) 22.VI.1942
Det: H.H.W.

## DISCOMYCETES EXSICCATI

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38. *Lanzia longipes* (Cke. & Peck *in* Cke.) Dumont & Korf *in* Korf & Gruff, Mycotaxon 7: 185. 1978.

On petioles of *Fraxinus americana* overwintered on ground.

Coy Glen, Ithaca, New York.

Leg: H.H.Whetzel & W.Lawrence White 22.VIII.1935
Det: R.P.K.

## DISCOMYCETES EXSICCATI

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39. *Lanzia luteo-virescens* (Rob. *in* Desmaz.) Dumont & Korf *in* Korf & Gruff, Mycotaxon 7: 185. 1978.

On petioles and veins of *Acer* sp.

McGowan's Woods, Ithaca, New York.

Leg: K.P.Dumont (137) & J.K.Rogers 16.X.1968
Det: R.P.K.

## DISCOMYCETES EXSICCATI

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40. *Martininia panamaensis* Dumont & Korf, Mycologia 62: 609. 1970 [≡ *Martinia panamaensis* Whetz., *nom. illegit.*]. ISOTYPE

On potato-dextrose agar from Martin's cultures isolated from bark collected by G.W.Martin (4175) about 3 km east of Canal Zone, Arraigán, Panama, on 13.VIII.1937.

Cornell University, Ithaca, New York.

Leg: H.H.Whetzel 4.VI.1942
Det: H.H.W.

## DISCOMYCETES EXSICCATI

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41. *Monilinia seaveri* (Rehm) Honey, Amer. J. Bot. 23: 105. 1936.

On mummified fruits of *Prunus serotina*.

Camp Fortune area, Gatineau Park, Quebec.

Leg: J.W.Groves, Sheila C.Thomson & Lynn K.Arnason (56-35) 15.V.1956
Det: J.W.G.

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## DISCOMYCETES EXSICCATI

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42. *Monilinia vaccinii-corymbosi* (Reade) Honey, Amer. J. Bot. 23: 105. 1936.

On berries of *Vaccinium corymbosum*.

Malloryville, New York.

Leg: E.J.Durand (2250) 11.V.1903
Det: R.P.K.

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43. *Myriosclerotinia caricis-ampullacea* (Nyberg) Buchwald, Friesia 3: 301. 1947.

On *Carex aquatilis*.

Below Nash Fork Bridge, 9600 ft., University of Wyoming Science Camp, Albany County, Wyoming.

Leg: W.G.Solheim (7318) & R.Solheim 27.VI.1942
Det: W.G.S.

## DISCOMYCETES EXSICCATI

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44. *Myriosclerotinia longisclerotialis* (Whetzel) Buchwald, Kongl. Veterinaer- og Landbohøjskoles Aarsskr. 1949: 156. 1949. ISOPARATYPE

On *Carex prairea.*

Swamp in field southwest of shack, Lloyd-Cornell Preserve, McLean, New York.

Leg: H.H.Whetzel (S312), Westcott & Bodger 24.V.1926
Det: H.H.W.

## DISCOMYCETES EXSICCATI

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45. *Myriosclerotinia scirpicola* (Rehm) Buchwald, Friesia 3: 296. 1947.

On *Scirpus lacustris.*

Shore of Lyngby Sø, Lyngby Sö, Denmark.

Apothecia collected 3-15.VI.1930; spermodochia 13.VII.1930.

Leg: H.H.Whetzel (E84)
Det: H.H.W.

## DISCOMYCETES EXSICCATI

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46. *Poculum petiolorum* (Rob. *in* Desmaz.) Dumont & Korf *in* Korf & Gruff, Mycotaxon 7: 185. 1978.

On overwintered leaves of *Quercus alba.*

Road along east side of Cayuta Lake, New York.

Leg: Whetzel, White, Viégas & Thomson 1.IX.1936
Det: W.L.White

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47. *Seaverinia geranii* (Seaver & Shope) Whetz., Mycologia 37: 705. 1945. [AUTHENTIC, TOPOTYPE of *Sclerotinia geranii* Seaver & Shope]

On rootstocks of *Geranium maculatum*.

Van Cortlandt Park, Bronx, New York City, New York.

Leg: H.H.Whetzel (S60), Seaver & Hopkins 1.V.1919
Det: F.J.Seaver

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48. *Septotinia podophyllina* Whetz. *in* Groves & Elliott, Canad. J. Bot. 39: 227. 1961. ISOTYPE

On *Podophyllum peltatum*.

Labrador Lake, New York.

Leg: H.H.Whetzel (S1219), F.L.Drayton *& al.* 5.V.1936
Det: H.H.W.

## DISCOMYCETES EXSICCATI

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49. *Stromatinia rapulum* (Bull. *ex* Mérat : Fr.) Boud., Hist. classific. discomy. Europe, p. 108. 1907. [ISOTYPE of *Sclerotinia smilacinae* E.Durand, Bull. Torrey Bot. Club 29: 462. 1902.]

On dead rootstocks of *Polygonatum* in rich humus.
Fall Creek, Ithaca, New York.

NOTES: Durand *(loc. cit.)* erroneously identified the host as *Smilacina racemosa*. Though the combination *Stromatinia rapulum* is credited to Boudier in synonymy by Rehm (Rabenh., Krypt.-Fl. 1(3)[40]: 823. 1893), and it also is so given on plate 478 and its accompanying list by Boudier (Icon. mycol., livr. 2, IX.1904), the generic name had not been published at those times. *Stromatinia* was only a subgeneric epithet from 1885 to 1907. R.P.K.

Leg: E.J.Durand (1155) 13.V.1901
Det: R.P.K.

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50. *Verpatinia calthicola* Whetzel, Mycologia 37: 692. 1945. ISOTYPE

On overwintered petioles of *Caltha palustris*.

Swamp north of Woods Road, Labrador Lake, New York.

Leg: Whetzel (S1319) & Viégas 23.V.1937
Det: Whetzel & Viégas

## DISCOMYCETES EXSICCATI

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51. *Anthracobia macrocystis* (Cke.) Boud., Hist. classific. discomy. Europe, p. 65. 1907.

On burned log.

Along road running from Forestry Campus to Mud Springs, Mt. Makiling, Los Baños, Luzon, Philippines.

Leg: K.P.Dumont & G.L.Dumont 27.V.1966
Det: R.P.K.

## DISCOMYCETES EXSICCATI

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52. *Ascobolus furfuraceus* Pers. *ex* Hook., Fl. scot. 2: 33. 1821. : Fr.

On cow dung.

Pasture near Lloyd-Cornell Preserve, McLean, New York.

Leg: R.P.K. 3.X.1958
Det: R.P.K.

## DISCOMYCETES EXSICCATI

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53. *Byssonectria fusispora* (Berk.) Rogerson & Korf *in* Korf, Phytologia 21: 202. 1971.

On soil under pine.

Cades Cove, Great Smoky Mountains National Park, Tennessee.

NOTES: This specimen has the basal hyphae that Svrček (Česká Myk. 23: 83-96. 1969) uses to distinguish *B. aggregata* (Berk. & Br.) Rogerson & Korf *in* Korf, but presently I accept Rifai's synonymy (Verh. Kon. Ned. Akad. Wetensch., Afd. Natuurk., Tweede Sect., 57(3): 198. 1968). R.P.K.

Leg: T.H.Campbell 26.II.1955
Det: R.P.K.

## DISCOMYCETES EXSICCATI

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54. *Cheilymenia coprinaria* (Cke.) Boud., Hist. classific. discomy. Europe, p. 63. 1907.

On porcupine dung.

Chaffey's Locks, Ontario.

Leg: R.P.K. 28.IX.1958
Det: R.P.K.

## DISCOMYCETES EXSICCATI

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55. *Cheilymenia theleboloides* (Alb. & Schw. *ex* Pers. : Fr.) Boud., Icon. mycol., livr. 1, pl. 60 [= Tom. 2, pl. 380], 1904.

On cow dung.

Estate of Mr. St. Pierre Du Bose, Chapel Hill, North Carolina.

Leg: W.C.Denison (1674) 7.X.1958
Det: W.C.D.

## DISCOMYCETES EXSICCATI

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56. *Cheilymenia theleboloides* (Alb. & Schw. *ex* Pers. : Fr.) Boud., Icon. mycol., livr. 1, pl. 60 [= Tom. 2, pl. 380], 1904.

On cow dung.

Test Gardens, Cornell University, Ithaca, New York.

Leg: M.A.Rosinski, R.A.Shoemaker & R.P.K. 18.VIII.1953
Det: R.P.K.

## DISCOMYCETES EXSICCATI

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57. *Cookeina sulcipes* (Berk.) O. Kuntze, Rev. Gen. Pl. 2: 849. 1891.

On soil.

Finca La Selva, Puerto Viejo, Costa Rica.

NOTES: There is a distinct gel layer in the ectal excipulum. I was clearly wrong (Korf, *in* Ainsworth, G.C. *& al.* [eds.], The Fungi 4A: 265. 1963) in assuming the absence of such a layer in true *Cookeinae*. R.P.K.

Leg: W.C.Denison (1906) 11.VI.1962
Det: W.C.D. & R.P.K.

## DISCOMYCETES EXSICCATI

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58. *Fimaria cervaria* (Phillips *in* Stevenson) Brumm., Persoonia 2: 325. 1962.

On deer dung.

Lost Gorge, Stage 7, Alpine, New York.

Leg: K.P.Dumont & R.P.K. 7.X.1968
Det: R.P.K.

## DISCOMYCETES EXSICCATI

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59. *Helvella acetabulum* (L. *ex* St.-Amans : Fr.) Quél., Enchirid. fung., p. 275. 1886.

On ground in mixed woods.

Queen's University Biological Station, Lake Opinicon, Ontario.

Leg: W.B.Kendrick 9.VI.1963
Det: J.W.Groves

## DISCOMYCETES EXSICCATI

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60. *Helvella macropus* (Pers. *ex* Gray : Fr.) Karst., Not. Sällsk. Fauna Fl. Fenn. Förh. 11: 224. 1870.

On ground among pine needles.

Queen's University Biological Station, Lake Opinicon, Ontario.

Leg: J.W.Groves 12.VII.1961
Det: R.P.K.

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61. *Jafnea fusicarpa* (Gerard) Korf, Nagaoa 7: 5. 1960.

On humus.

Six Mile Creek, Ithaca, New York.

Leg: E.J.Durand (1523) 29.VII.1902
Det: E.J.D.

## DISCOMYCETES EXSICCATI

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62. *Jafnea semitosta* (Berk. & Curt. *in* Berk.) Korf, Nagaoa 7: 5. 1960.

On moist soil.

Fish hatchery on Judd Falls Road, Ithaca, New York.

Leg: F. Kuss & K.P.Dumont 20.IX.1965
Det: R.P.K. & K.P.D.

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## DISCOMYCETES EXSICCATI

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63. *Jafnea semitosta* (Berk. & Curt. *in* Berk.) Korf, Nagaoa 7: 5. 1960.

On sandy loam soil, under fallen leaves.

Kansas University Natural History Reserve, Kansas.

Leg: L.R.Batra (1849) 16.X.1962
Det: L.R.B.

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64. *Jafneadelphus asperulus* Rifai var. *asperulus*, Verh. Kon. Ned. Akad. Wetensch., Afd. Natuurk., Tweede Sect., 57(3): 91. 1968.

On burnt over ground under *Eucalyptus*.

About seven miles from Carlisle on Colac Road, Australia.

Leg: G.Beaton 1.IX.1968
Det: R.P.K.

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65. *Jafneadelphus ferrugineus* (Phill. *in* Cke.) Rifai ssp. *imaii* (Korf) Rifai, Verh. Kon. Ned. Akad. Wetensch., Afd. Natuurk., Tweede Sect., 57(3): 90. 1968. ISOTYPE of *Jafnea imaii* Korf.

On duff.

Between Kiyomizu Temple and Maruyama Park, Kyoto, Kyoto Pref., Honshu, Japan.

Leg: S.Imai, M.Hamada, T.Hongo & R.P.K. 23.X.1957
Det: R.P.K.

## DISCOMYCETES EXSICCATI

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66. *Lamprospora macracantha* (Boud.) Seaver, North Am. Cup-Fungi (Oper.), p. 63. 1928, as 'macrantha.'

On soil in woods by road.

Connecticut Hill, near Ithaca, New York.

Leg: W.C.Denison (1208) & family VII.1956
Det: R.P.K. & S.C.G.

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67. *Lamprospora ovalispora* (Svr. & Kub.) Eckbl., Nytt Mag. Bot. 15: 42. 1968.

On mossy soil.

Mt. Toby State Forest, Massachusetts.

Leg: M.Christensen, J.W.Kimbrough, 25.VIII.1963
R.T.Moore & R.P.K.
Det: R.P.K. & S.C.G.

## Discomycetes Exsiccati

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68. *Octospora leucoloma* Hedw. *ex* Gray, Nat. arr. Brit. pl. 1: 667. 1821. : Fr.

On soil among mosses.

Just north of San Andrés at km mark 17.8, Hierro, Canary Islands.

Leg: R.P.K., R.Fogel, G.L.Hennebert & L.M.Kohn 7.I.1977
Det: R.P.K.

## Discomycetes Exsiccati

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69. *Peziza endocarpoides* Berk. *in* Hook. f., Fl. Nov. Zeal. 2: 199. 1855. [= *Plicaria leiocarpa* (Curr.) Boud.]

On soil under needles in *Pinus* woods.

Burn site along road below Poiso, toward Monte, at km mark 10.5 from Funchal, Madeira.

Leg: R.P.K., R.Fogel, G.L.Hennebert & L.M.Kohn 13.I.1977
Det: R.P.K.

## Discomycetes Exsiccati

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70. *Scutellinia geneospora* (Berk.) O. Kuntze, Rev. Gen. Pl. 2: 896. 1891.

On *Cryptomeria japonica* log and on soil.

Woods near railroad at 1000 m elev., Kagoshima-ken, Yaku Island, Japan.

NOTES: This is the type species of *Geneosperma* Rifai (Verh. Kon. Ned. Akad. Wetensch., Afd. Natuurk., Tweede Sect., 57(3): 102. 1968), possibly a good genus. The ascospore follicle is remarkable and deserves EM study! R.P.K.

Leg: Y.Kobayasi, K.Tubaki & R.P.K. 20.X.1961
Det: R.P.K. & Marcelle Le Gal

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71. *Cenangium atropurpureum* Cash & Davidson, Mycologia 32: 734. 1940.

On *Pinus ponderosa.*

Hamilton, Massachusetts.

Leg: P.Spaulding & J.R.Hansbrough 4.VI.1928
(Forest Path. 45641)
Det: R.P.K. & S.C.G.

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## DISCOMYCETES EXSICCATI

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72. *Cenangium ferruginosum* Fr. *ex* Fr., Syst. mycol. 2: 187. 1822.

On *Pinus strobus.*

Hector Land Use area, Lodi, New York.

Leg: R.P.K., L.M.Kohn & M.A.Sherwood 17.V.1975
Det: L.M.K.

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73. *Phibalis fascicularis* (Alb. & Schw. *ex* Fr.) Wallr., Fl. Crypt. Germ. 2: 447. 1833.

On living *Populus tremuloides.*

Lloyd-Cornell Preserve, McLean, New York.

Leg: Mycology Class 22.V.1961
Det: R.P.K.

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74. *Phibalis pinastri* (Cke. & Peck *in* Cke.) Korf & Kohn, Mem. New York Bot. Gard. 28: 115. 1976. [≡ *Cenangium acuum* Cke. & Peck *in* Cke. & Ellis]

On needles of *Pinus resinosa.*

Gate Mill, Ohio.

Leg: J.R.Hansbrough (Forest Path. 81737) 29.IV.1936
Det: R.P.K.

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75. *Phibalis pruinosa* (Ell. & Everh.) Kohn & Korf *in* Korf & Kohn, Mem. New York Bot. Gard. 28: 111. 1976.

On trunk of standing *Populus* cfr. *deltoides*.

Lower Creek Road near Etna, Ithaca, New York.

Leg: L.M.Kohn, R.P.K. & T.Stasz 7.V.1975
Det: L.M.K. & R.P.K.

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# STUDIES ON DIMARGARITACEAE (MUCORALES) I. TIEGHEMIOMYCES AND DISPIRA FROM INDIA

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## *SUMMARY*

In this first paper of a series on Dimargaritaceae, three species - *Tieghemiomyces parasiticus* Benjamin, *Dispira simplex* Benjamin and *Dispira cornuta* van Tieghem - are reported for the first time from India.

The family Dimargaritaceae was established by Benjamin (1959) to include four genera of merosporangiferous Mucorales: *Spinalia* Vuillemin, *Dimargaris* van Tieghem, *Dispira* van Tieghem and *Tieghemiomyces* Benjamin. At present, one species of *Spinalia*, seven species of *Dimargaris*, three species of *Dispira* and two species of *Tieghemiomyces* are recognized (Benjamin, 1966; Hesseltine and Ellis, 1973). With the exception of *Dispira simplex*, which parasitizes *Chaetomium*, the species included in the Dimargaritaceae are parasites or facultative parasites of other Mucorales. They produce two-spored merosporangia and have septate hyphae with septa containing median plugs. The sporangiophores range from simple to very complex and their morphology forms the basis for the separation of genera. The zygospores, where known, are borne between undifferentiated hyphae and are globose, hyaline and punctate. Of the four genera of Dimargaritaceae, only *Dimargaris* has so far been reported from India (Mehrotra and Baijal, 1963, 1964).

A recent study of the coprophilous Mucorales of Gorakhpur, U.P., has led to the isolation of several members of the Dimargaritaceae. Their occurrence in Gorakhpur is of considerable interest in view of the observation made by Hesseltine and Ellis (1973) that this family, together with the related family Kickxellaceae, may represent geographical isolation in arid regions since most of the species have been found in the Southern California area.

The district of Gorakhpur is situated in the sub-tropical zone and occupies the extreme north-east corner of Uttar Pradesh. It stands in 26°5' and 27°29' north latitude and 83°4' and 84°26' east longitude at a height of about 95 m above sea level. The climate of Gorakhpur is monsoonal having a hot and dry summer, a wet and warm rainy season, followed by a cool winter. The total annual rainfall is about 1,120 mm. The mean relative humidity during rainy, winter and summer seasons is 78, 66 and 49 per cent, respectively.

For the isolation of fungi, samples of mouse dung collected from fields were placed into aseptic moist chambers prepared by moistening several thicknesses of filter paper discs in petri dishes (Benjamin, 1959). The dung pellets were observed frequently for a period of 2 - 3 weeks for the development of desired fungi. Attempts were made to bring the species into pure or two membered culture on Yeast extract soluble starch agar (YpSs: Benjamin, 1959).

In this first paper of a series on species of Dimargaritaceae, one species of *Tieghemiomyces* and two of *Dispira* are reported for the first time from India.

TIEGHEMIOMYCES PARASITICUS Benjamin FIG. 1
Aliso 5: 11. 1961.

Colonies on *Cokeromyces recurvatus* on YpSs dirty white in color. Sporophores erect, septate, 2-3 mm high, with main axis 8-13 μ in diam, each bearing three fertile branches one above the other on the same side immediately below three of the septa at a height of 400-800 μ from the base. Fertile branches lacking sterile prolongations, subverticillately branched, with a main axis bearing one or two series of branchlets arising below the septa; main axis of fertile branches composed of 2-4 superposed cells constricted at their septa, with basal cell 11-23 × 8-14 μ; the ultimate sporiferous branchlets composed of 1-3 superposed cells bearing distal whorls of 2-spored merosporangia. Spores ovoid to ellipsoid, 3.4-4.6 × 2.3-3.0 μ, remaining dry at maturity. Zygospores not seen.

Isolated from mouse dung collected from wheat field, Nagara village, Gorakhpur, U.P., January 1976 (PCM *563*) and December 1977 (PCM *609*). Both isolates showed very restricted growth on *Cokeromyces recurvatus* on YpSs.

*Tieghemiomyces parasiticus* has been known only from the original description, by Benjamin (1961), of an isolate from mouse dung collected in Illinois (U.S.A.).

DISPIRA SIMPLEX Benjamin FIG. 2
Aliso 4: 387. 1959.

Colonies on mouse dung dirty white in color. Sporophores erect, septate, up to 2.5 mm high, with main axis 6-10 μ wide near the middle, bearing 2-4 fertile branches at a height of 600-900 μ from the base. Fertile branches at first several times branched, with each division sympodially branched forming angular axes and having at each node a sterile branchlet, a fertile branchlet and a branch which continues the axis. Sterile branchlets flexuous, simple or 1-septate, 46-70 μ long, 2.3-3.5 μ wide at the base, gradually tapering to 0.5-1.0 μ wide at the tip. Fertile branchlets recurved, 36-46 μ long, 2.3-3.5 μ wide in the middle, bearing at the tip 2-3 sporiferous branchlets formed successively by budding. Sporiferous branchlets not subtended by vesicles, 12-14.5 × 5-7 μ, composed of two slightly ovoidal cells bearing distal whorls of 2-spored merosporangia; the terminal parts of the merosporangia developing by apical budding from the basal. Spores subglobose to ovoid, 3.0-4.0 × 2.3-3.5 µ, remaining dry at maturity. Zygospores not seen.

Isolated from mouse dung collected from groundnut field, Nagara village, Gorakhpur, U.P., February 1976. It could not be brought into pure or two-membered culture on agar media.

*Dispira simplex* was described by Benjamin (1959) from several specimens observed on mouse and rat dung collected from California, and was subsequently shown to be parasitic on *Chaetomium* (Benjamin, 1961). Indoh (1965) reported this species from Japan growing on *Mucor* sp. and *Circinella* sp.

DISPIRA CORNUTA van Tieghem FIG. 3
Ann. Sci. Nat. Bot., Sér. 6, 1: 160. 1875.

Colonies on *Cokeromyces recurvatus* on YpSs white in color. Sporophores erect, septate, up to 5 mm high, bearing 2-5 fertile branches at a height of 2-3 mm from the base. Fertile branches sympodially branched forming spirally coiled main axes bearing laterally 5-14 fertile branchlets and finally terminating in a slender, septate, sterile prolongation 2-3 mm long and 3.0-5.0 µ wide. Fertile branchlets recurved, septate, bearing laterally 1-3 sterile branchlets and terminated by globose fertile heads 27-48 µ in diam. Sterile branchlets recurved or slightly coiled, 40-100 µ long, 2.8-5.7 µ in diam at the base, narrowly attenuated, once or twice septate. Fertile heads composed of globose vesicles 11.4-15.2 µ in diam bearing sporiferous branchlets all over their surface. Sporiferous branchlets 7.0-9.2 × 3.4-4.6 µ, composed of two subequal cells bearing distal whorls of 2-spored merosporangia. Spores elongate-ovoid, 3.4-5.7 × 1.7-2.8 µ. Spore heads remaining dry. Zygospores not seen.

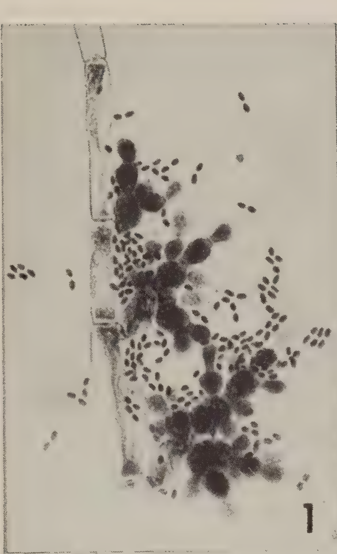
Isolated from mouse dung collected from a wheat field, Nagara village, Gorakhpur, U.P., March 1976 (PCM *564*, = RSA *2173*). The isolate grew well on *Cokeromyces recurvatus* on YpSs. The species was subsequently seen several times on mouse dung collected from various localities of Gorakhpur.

*Dispira cornuta* is known from France (van Tieghem, 1875; Bainier, 1906), England (Elliott, 1926), China (Ou, 1940), Japan (Indoh, 1965), Java (Boedijn, 1958) and North America (Thaxter, 1895; Ayers, 1933, 1935; Benjamin, 1959).

## *ACKNOWLEDGMENTS*

The authors thank Dr. R. K. Benjamin for examining a culture of *Dispira cornuta*, Dr. J. J. Ellis for providing a culture of *Cokeromyces recurvatus*, and Dr. R. W. Embree for reviewing the manuscript. The work

FIG. 1. *Tieghemiomyces parasiticus*, fertile region of sporophore, × 300.
FIG. 2. *Dispira simplex*, a portion of sporophore with two fertile branch systems, × 330.
FIG. 3. *Dispira cornuta*, upper portion of sporophore, × 350.



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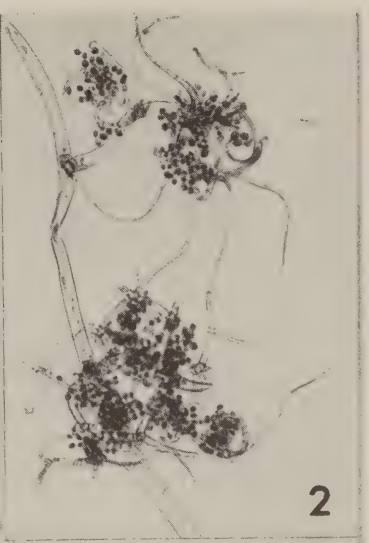

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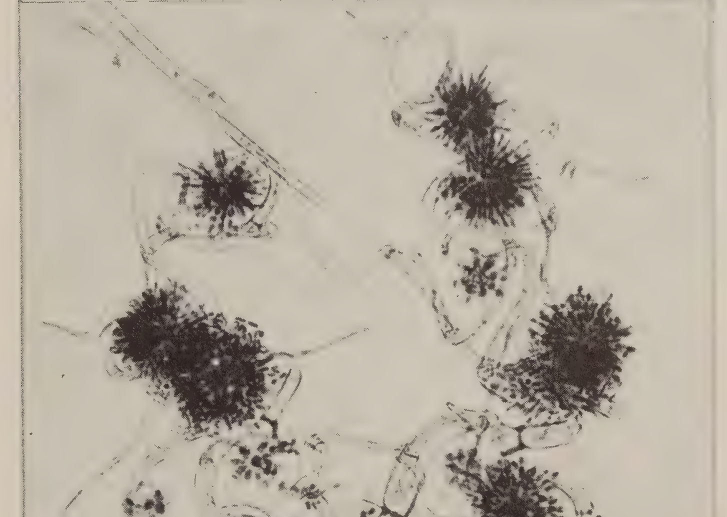

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# TYPE STUDIES IN THE GENUS PEZIZA III. OPERCULATE DISCOMYCETES COLLECTED BY W. R. GERARD

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The following is a continuation of my type studies of *Peziza* species. In this article species described by William Ruggles Gerard are discussed, as are collections made by Gerard and described by M. C. Cooke.

I am indebted to the Directors and Curators of the Royal Botanic Gardens, Kew, and the New York Botanical Garden for the loan of specimens.

*Peziza atrovinosa* Cooke, Bull. Buffalo Acad. Sci. *2*: 288. 1875; Mycographia p. 130, fig. 225. 1876. ut "Gerard" ut "Gerard & Cooke," Sacc. Syll. Fung. *8*: 83. 1889.
≡ *Aleurina atrovinosa* (Cooke) Seaver, North American cup-fungi (operculates). p. 101. 1928.
≡ *Galactinia atrovinosa* (Cooke) Le Gal, Bull. Soc. Mycol. France *78*: 207. 1962.
= *Peziza chlamydospora* Ell. & Ev., Bull. Torrey Bot. Club *10*: 98. 1883
[= *Galactinia cristulata* Le Gal, Ann. Sci. Nat. Bot. ser. II, *8*: 98. 1947. a nomen nudum]

Apothecia gregarious to cespitose, medium sized 2.5 - 5 cm, sessile or with a very short stipe. Disc concave, smooth, pale brown or smoky color, when dry, black to blackish brown, sometimes olivaceous. Receptacle saucer-shaped or cupulate, margin entire, sometimes contorted by mutual pressure, outer surface generally black when dry. The excipulum is composed of large subglobose to pyriform cells 10-30 μm diam, these are often and regularly interspersed with septate hyphae 5 - 7 μm in diam; toward the outer surface the cells become angular or compressed and are oriented in a somewhat parallel fashion, cells of the outermost layer elongate to form short hairs which sometimes produce a pustulate appearance. Subhymenium of angular cells. Hymenium about 200 - 230 μm thick. Asci cylindrical, apex blued in Melzer's reagent, 200 - 260 x 10 - 12μm, 8-spored. Ascospores uniserriate, biguttulate, ellipsoidal, at first hyaline and smooth-walled, but soon covered with yellow to brown ridges and warts which anastomose to form an irregular reticulum, in some cases an apiculus develops at each end of the spore. The markings reach a height of 2 µm. Spores 12 - 13 x 7 - 8 µm, excluding markings. Paraphyses rather stout, septate unbranched, yellowish, 3 - 4 µm diam below, apex enlarged to 7 µm.

On soil in woods, sometimes with mosses on wood.

The two descriptions, published within a year of each other are essentially the same. There is some confusion over specimens which should be clarified. In the original description Cooke cites the collection as from Ellis, New Jersey. This he later corrected (Bull. Buffalo Soc. Nat. Sci. *3*: 21. 1875) to state Gerard, New York. Rifai has selected a Gerard specimen in Kew (2227) as lectotype. This specimen is from Poughkeepsie, New York.

*Peziza retiderma* Cooke, also a North American species, is closely related. I have not yet examined the holotype in Kew, however, descriptions by Le Gal (1953) and Rifai (1968) of the species agree with several collections in the Farlow Herbarium. The spores of *P. retiderma* are smaller, tend to be more grossly marked, and more regularly ellipsoid than those of *P. atrovinosa*. It appears to be a species which has tropical affinities. Le Gal described it from Madagascar; Rifai described it from New Zealand.

Also related to these species is a third one *Aleurina stipitata* Cash from Panama (isotype, FH). In *A. stipitata* the spores are also small. They are marked with very large warts which rarely anatomose. Additionally, the apothecium has a short stipe.

*Peziza atrovinosa*, to date, is known only from North America. In Europe *Peziza ostracoderma* Korf has often been confused with *P. atrovinosa*. The two differ in apothecial anatomy and in the form of ornamentation of the ascospores.

64. *Peziza fusicarpa* Gerard, Bull. Torrey Bot. Club *4*: 1873.
≡ *Lachnea fusicarpa* (Gerard) Sacc., Syll. Fung. *8*: 159. 1889.
≡ *Scutellinia fusicarpa* (Gerard) Kuntze, Rev. Gen. Pl. *2*: 869. 1891.
≡ *Macropodia fusicarpa* (Gerard) Durand, J. Mycol. *12*: 29. 1906.
≡ *Jafnea fusicarpa* (Gerard) Korf, Nagaoa *7*: 5. 1960.

This is the type species of the genus *Jafnea*.

*Peziza gerardii* Cooke, Mycographia *1*: 26, fig. 44. 1875.

≡ *Leucoloma gerardii* (Cooke) Lamb., Fl. Mycol. Belg. Suppl. *1*: 318. 1887.

≡ *Humaria gerardii* (Cooke) Sacc., Syll. Fung. *8*: 150. 1889.

≡ *Humarina gerardii* (Cooke) Seav., North American cup-fungi (operculates). p. 138. 1928.

≡ *Galactinia gerardii* (Cooke) Bánhegyi, Borbásia *2*: 150. 1940.

= *Peziza ionella* Quél., Bull. Soc. Bot. France *24*: 328. 1877.

≡ *Aleuria ionella* (Quél.) Gill., Champ. Fr. Discom. p. 51. 1879.

≡ *Humaria ionella* (Quél.) Sacc., Syll. Fung. *8*: 149. 1889.

≡ *Galactinia ionella* (Quél.) Boud., Hist. Class. Discom. d'Eur. p. 47. 1907.

= *Plicaria pedicellata* Velen., Novit. Mycol. p. 198. 1940.

Apothecia occurring abundantly, small, .5 to .7 cm diam, subsessile or with a short stipe. Disc shallowly concave to discoid, smooth, violet when fresh, brownish when dried. Receptacle colored like the disc, shallow cupulate. Excipulum composed entirely of globose to angular cells, 25 - 50 µm in diam; toward the outer surface the cells become smaller, 10 - 15 µm in diam, and occasionally, toward the margin, these smaller outer cells produce short, appressed, hyphoid hairs, 20 - 40 x 10 - 12 µm. These hyphae are septate and blunt at the apex. Hymenium about 250 - 300 µm thick. Asci cylindrical, the apical portion becoming diffusely blue in Melzer's reagent, 230 - 245 x 14 - 16 µm, 8-spored without obvious croziers. Ascospores uniserriate or slightly overlapping, with 1, 2, 3 or many oil guttules, smooth, fusoid, 28 - 32 (-35) x 7 - 9 µm. Paraphyses infrequently septate, unbranched, 3 - 4 µm below, at the apex 5 µm.

On moist ground.

I have followed Svrček (1976) in listing *Plicaria pedicellata* as a synonym.

*Peziza gerardii* cannot easily be confused with other smooth-spored Pezizas. Its large, smooth, fusiform spores, and small, often stipitate, violet apothecia serve to distinguish it. Though rarely collected, it is widely distributed. It is known from Europe and North America where it inhabits moist banks.

The description above is based upon a study of the Gerard specimen at NY and upon a large collection in the von Höhnel Herbarium (FH) under the name *Galactinia ionella.*

*Peziza griseo-rosea* Gerard, Bull. Torrey Bot. Club *6*: 31. 1875; Bull. Buffalo Acad. Sci. *2*: 288. 1875.

This species is apparently not often identified. The color of the hymenium (pale rosy then subochraceous) and the ornamentation and size of the ascospores distinguish it from *Peziza howsei* Boud., with which it might easily be confused. In *P. griseo-rosea* the spores are 14 - 17 x 8 - 11 µm and are ornamented with large, low warts which sometimes anastomose. In contrast, the ascospores of *P. howsei* are larger (19 - 22 x 8 - 11 µm fide Le Gal, 1942) and are marked with fine isolated warts. In both species the spores are biguttulate.

The type, which is not well-preserved, does show that the exciple is composed largely of globose cells and that there are no pustules or warts on the outside. Specimens from North America which I tentatively identify as *Peziza howsei* have well-developed pyrimidal warts on the outer surface. These warts are composed of globose cells.

*Peziza pulchra* Gerard, Bull. Torrey Bot. Club *4*: 64. 1873.

≡ *Geopyxis pulchra* (Gerard) Sacc., Syll. Fung. *8*: 65. 1889.

This is a species of *Geopyxis*. Seaver (1928) placed it in the synonymy of *Geopyxis vulcanalis* (Peck) Sacc.

*Peziza scubalonta* Cooke & Gerard, Grevillea *4*: 92. 1889.

≡ *Lachnea scubalonta* (Cooke & Gerard) Sacc., Syll. Fung. *8*: 179. 1889.

≡ *Scutellinia scubalonta* (Cooke & Gerard) Kuntze, Rev. Gen. Pl. *2*: 869. 1891.

Denison (1964) placed this name in the synonymy of *Cheilymenia stercorea* (Pers. ex Fr.) Boud. a name which Maas Geesteranus (1969) determined was misapplied. He replaced *C. stercorea* with *C. ciliata* (Bull. ex St-Amans) Maas G. *Peziza scubalonta* was synonymized with that species by Maas Geesteranus. I have not reexamined the specimen.

*Peziza truncicomes* Gerard in Cooke, Mycographia *1*: 147, fig. 249. 1876.

This fungus might be tentatively referred to *Peziza ampliata* Pers. ex Pers. It occurs on rotten stumps. The asci are J+. Ascospores are smooth and 13 - 15 x 8 - 9 µm. The flesh seems to be composed of globose cells with no middle layer of interwoven hyphae. Neither Dennis (1968) nor Svrček (1970) seem to resolve the problems of classifying the smooth-spored species of *Peziza*.

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# TYPE STUDIES IN THE GENUS PEZIZA IV. SPECIES DESCRIBED BY F. E. CLEMENTS.

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Under the genera *Peziza* [Dill.] L. ex St-Amans, *Plicaria* Fuckel emend. Boud., *Galactinia* (Cooke) Boud., *Iotidea* Clem., *Podaleuris* Clem., and *Heteroplegma* Clem., F. E. Clements described several species of *Peziza*, principally from Nebraska and Colorado. The identity of these species is discussed in this paper.

The specimens studied were kindly lent by the National Fungus Collection, Beltsville, MD. Several of the type collections have not been located and are presumed lost. Doctors Richard P. Korf and Harold J. Larsen have read the manuscript and have provided important comments.

*Peziza brunneo-vinosa* Clem., Bot. Surv. Nebraska *4*: 8. 1896.

On sand in canyons of the Niobrara River, Keya Paha County, Nebraska. BPI.

Clements reported that the asci did not become blue in iodine but in the type collection there is a faint blue reaction. The spores of *P. brunneo-vinosa* are ornamented with low warts, rather than smooth as reported originally by Clements.

The species seems closest to *Peziza michelii* (Boud.) Dennis in its ascospore ornamentation and hymenial color. Le Gal (1941) noted that there was a violet form found both in Spring and Fall.

*Heteroplegma caeruleum* Clem., Bull. Torrey Bot. Club *30*: 92. 1903.

≡ *Peziza caerulea* (Clem.) Sacc. & D. Sacc., Syll. fung. *18*: 20. 1906, non *P. caerulea* Bolt. ex Fr., Syst. Mycol. *2*: 86. 1822.

Ad terram udam umbrosamque, Dark Cañon, Septembri, 1899. BPI.

This is the type species of the genus *Heteroplegma* Clem. Eckblad (1968) who did not see the specimen suggested that *Heteroplegma* should be regarded as a synonym of *Peziza*. The specimen confirms Eckblad's supposition.

*Heteroplegma caeruleum* shows a unique combination of characters which warrants recognition as a distinct species. Unfortunately, the epithet in *Peziza* is preoccupied. Should another available name for this species not be discovered during these type studies a new name will be necessary. The characteristics of the ascospores, the blue color at the base of the apothecium reported by Clements, and the production of a blue juice when damaged define the species. It may be closely related to *P. saniosa* Fr. ex Shrad. and *P. badio-fusca* (Boud.) Dennis both of which produce blue juice when damaged. However, both of these species produce small apothecia and differ in ascospore size and ornamentation.

To Clements's description, the following supplementary comments may be added: The ascospores are 18 - 20 x 8.5 - 9 µm, obscurely biguttulate, and very finely warted much as in *Peziza badio-confusa* Korf. In some cases the guttules seem to break apart and fill the ascospores with small refractive droplets.

*Plicaria chlorophysa* Clem., Bull. Torrey Bot. Club *30*: 91. 1903.

≡ *Peziza chlorophysa* (Clem.) Sacc. & D. Sacc., Syll. fung. *18*: 18. 1906.

Ad lignum udum vel ustumque, Jack Brook, Augusto. BPI; ad fimum udum, Castle Cañon, Septembri, 1900, FH (lectotype), BPI, issued as no. 123 in *Cryptogamae Formationum Coloradensium*.

When Clements described this species he listed two collections, one from Jack Brook, and one from Castle Cañon. The two collections are identical, and the portion of the Castle Cañon collection in *Cryptogamae Formationum Coloradensium* FH is designated lectotype. It was collected on dung and, despite Clements's original description which records the ascospores as 18 x 11 µm, the ascospores are 20 - 21 x 11 - 12 µm. The collection is composed of small apothecia of *Peziza vesiculosa* [Bull.] ex Fr. The spores are smooth and eguttulate. Unfortunately the excipulum is so poorly preserved in the specimens examined that it is impossible to verify that the excipulum agrees with that found in *P. vesiculosa*.

Seaver (1928) listed this species as a questionable synonym of *Peziza fimeti* (Fuckel) Seaver which, however, has smaller ascospores.

*Heteroplegma crenatum* Clem., Bull. Torrey Bot. Club *30*: 92. 1903.

≡ *Peziza crenata* (Clem.) Sacc. & D. Sacc., Syll. fung. *18*: 19. 1906, non *P. crenata* Pers. ex Mérat, Nouv. Fl. Env., ed 2, *1*: 171. 1821.

Ad terram pinquem udosamque inter moscos, Duxton Brook, Minnehaha, Colorado, Augusto, 1902.

No holotype material of *Heteroplegma crenatum* has been found; however, a later collection was issued in *Cryptogamae Formationum Coloradensium* as number 125. This specimen (Jack Brook 2500m, 22 Aug. 1904) is *Peziza arvernensis* Boud. It does not agree completely with the original description particularly, in that the margin was originally described as crenate and black furfuraceous. In the exsiccata specimen the margin is light and nearly smooth though it is occasionally torn radially. The spores are also smaller in the exsiccata specimen than originally described. Future collections from Colorado might yield specimens which agree with the original description of *H. crenata*. Seaver (1928) listed *H. crenata* as a synonym of *Peziza abietina* Pers. ex Fr. (≡ *Pseudotis abietina* (Pers. ex Fr.) Boud.).

The exsiccata collection is brownish, has eguttulate finely warted ascospores 13 - 16 x 7 - 8 µm. The excipulum is composed of large globose cells, there is a narrow layer of interwoven hyphae, and on the outside there is a layer of loosely interwoven hyphae.

*Peziza elaeodes* Clem., Bot. Surv. Nebraska p. 6. 1901.

On twigs of *Juniperus scopulorum*, Mead's Spring, Brown County, Nebraska, (12102).

I have not been able to locate type or authentic collections of *Peziza elaeodes*. It is described as having small, sessile, convex olivaceous apothecia; the spores are said to be 25 x 10 µm, asperate and apiculate. The description and habitat are suggestive of *Peziza apiculata* Cooke. This is in agreement with Seaver's (1928) conclusion regarding this species.

*Peziza roseo-lilacina* Clem., Bot. Surv. Nebraska p. 7. 1901.

On wet sandy soil, growing among mosses, Barney Creek, Keya Paha County, Nebraska, (12103).

I have been unable to locate any specimen of this species. The description of its color suggests *Peziza griseo-rosea* Gerard, but that species has ornamented ascospores. The spores of *P. roseo-lilacina* were said to be smooth.

*Galactinia viridi-tincta* Clem., Bot. Surv. Nebraska *4*: 9. 1896.

On shady ground, Otowanie Woods, Lancaster County, Nebraska. BPI.

The type specimen is barely mature. Clements described the ascospores as smooth. The few mature ascospores which were seen were ornamented with moderate-sized isolated warts. The spores are 15 - 17 x 7 - 8 µm. Clements reported that the apothecia when injured exude a grayish-green liquid and that the apothecia become greenish when injured. This feature in addition to ascospore size and ornamentation suggests that this species might be identical to *Galactinia succosella* Le Gal and Romagnesi a species I have not yet studied. Should the two prove to be identical the Clements name, being older, would have priority.

*Plicaria vinacea* Clem., Bot. Surv. Nebraska p. 9. 1896.

≡ *Peziza vinacea* (Clem.) Sacc. & Syd., Syll. fung. *14*: 745. 1899, non *Peziza vinacea* Rabenh., Fungi Europ. 2314. 1876.

On damp ground in shady woods, Wabash, Nebraska.

No specimens of this species have been seen. It was said to be rather small, 7 - 15 mm in diam, applanate at maturity and orange-vinous then vinous-brick colored. The spores were reported as smooth, eguttulate, hyaline 16 - 20 x 10 - 12. The asci were J+.

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# A NEW TREMELLA FROM MEXICO

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*Tremella aurantiolutea* Lowy, sp. nov. Figs. 1-2

Fructificatio in humido duro-elastica gelatinosa, circa 4 cm lata, 1.5 cm alta; lobuli solidi, homogenei, imbricati, usque ad 1 mm crassi; marginibus inspissatis, circa 1.5 mm crassis; in superficie superiore laevis, inferiore rugulosa; in sicco aliquantulum contractio, duro coriacea; aurantio-lutea per omnes partes, sed in zona angusta (circa 2 mm lata) pigmentum margine permultum intentus; hymenio amphigeneo, circa 45 μm lata cum basidia conferta; hyphae enodosae; probasidia globosa vel subglobosa, 9-11 μm diam; metabasidia ovoidea vel subpyriforme, cruciatim septata, 12-18 (-20) X 9-11.5 μm; sterigmata matura perangusta, apex amplificatus ad 5 μm diam, cum spiculis brevibus; basidiosporae ovoidae, (7.5-) 8.0-9.0 (-10) μm X 5-6 μm, per repetitionem germinantes vel promycelium promittentes.

Holotype: Mexico. El Mirador, Municipio de Totultla, Est. Veracruz. On dead wood in oak forest, 23-III-1972. Alt. 1000 m. Leg. F. Ventura No. 5429 (ENCB); Isotype (LSUM).

Fructification tough rubbery gelatinous when wet, ± 4 cm broad X 1.5 cm thick, with solid, homogeneous, imbricate lobes ± 1 mm thick, with margins thickened to ± 1.5 mm; superior surface smooth, inferior surface rugulose; drying tough coriaceous, somewhat diminished in size; orange-yellow pigment prominent throughout, with a 2 mm marginal zone bearing deeper orange pigmentation, becoming more intense when soaked, the rest of the fruiting body fading to a lighter hue; hymenium amphigenous, ± 45 μm wide, densely crowded with basidia; hyphae without clamp connections; probasidia spherical to subspherical, 9-11 μm diam; metabasidia becoming ovoid to subpyriform, 12-18 (-20) X 9-11.5 μm,

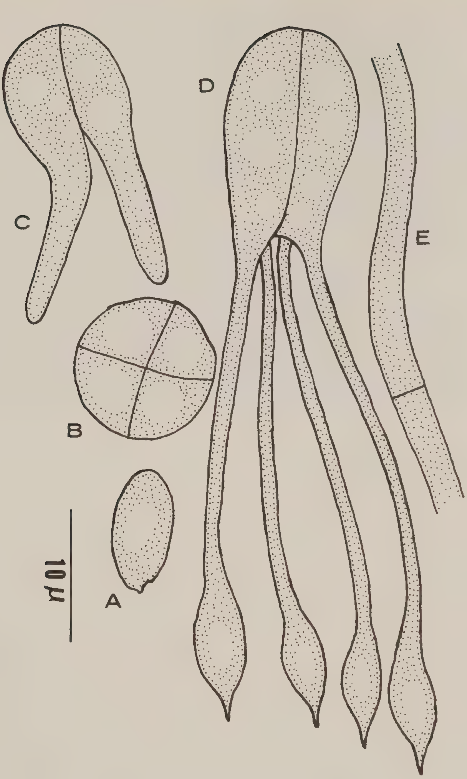

Fig. 1. *Tremella aurantiolutea* Lowy. A, basidiospore; B, apical view of cruciate septate basidium; C, 2-sterigmate developing basidium; D, mature metabasidium with 4 apically enlarged sterigmata, each terminating in a spiculum; E, septate hypha.

Cruciate septate; mature sterigmata narrow cylindrical ± 2 mm diam, apically expanded to form a bulbous to elongate extremity up to 5 µm diam and producing a short spicule; basidiospores ovoid, (7.5-_ 8.0-9.0 (-10) X 5-6 µm germinating by germ tube or by repetition.

Of the 16 species of *Tremella* reported from the neotropics (Lowy, 1971), four are characterized by having reddish to orange or yellow pigments variously distributed in the basidiocarp. These are *T. aurantia* Schw. ex Fries,

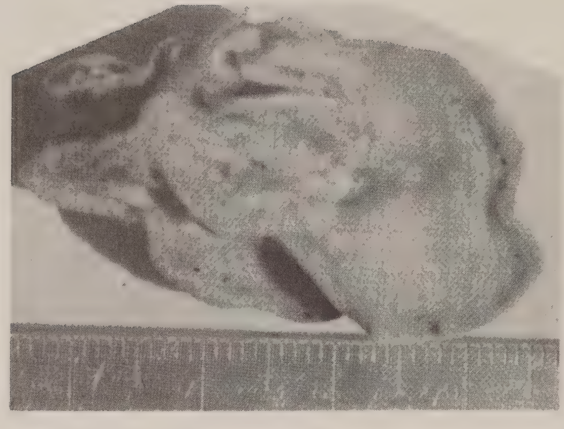

Fig. 2. Superior surface of *Tremella aurantiolutea* Lowy. Apx. X 2.

*T. brasiliensis* (Möller) Lloyd, *T. lutescens* Fries, and *T. rubromaculata* Lowy. *T. subrubiginosa* Lowy (1976) was recently described as sharing this macroscopic characteristic, and a sixth species is now added to the list. These brightly pigmented species may easily be separated into two groups, those having solid lobes and those with hollow lobes. *T. aurantia* and *T. subrubiginosa* are solid lobed, as is the new species here described, but in gross morphology, it is the prominently lobed *T. aurantia* that resembles the new species much more closely. The similarity, however, is superficial, since a section through a lobe of *T. aurantia* reveals that it is heterogeneous in composition, consisting of a conspicuous whitish, fleshy fibrous core which can be clearly differentiated upon inspection from the pigmented, amphigenous hymenial layers. By contrast, the lobes of the new species are homogeneous in section, having a tough gelatinous composition throughout. The clamped hyphae and subspherical basidiospores of *T. aurantia* further separate it from the new species, which has clampless hyphae and ovoid basidiospores.

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# A NEW SPECIES OF PANAEOLUS FROM SOUTH AMERICA

by

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Through the research trips to South America made by the author, one in 1964 and two in 1971, looking for species of Psilocybe for the world monograph that he is preparing, he found in Venezuela an interesting undescribed species of Panaeolus which here is described as new. The author expresses his thanks to Guggenheim Memorial Foundation of New York for the grant supporting the trips of 1971 to South America. He also thanks Dr. L. Marcano Berti and Dr. E.A. Fábrega both from the University of Los Andes, at Venezuela, for generously hosting the forays in Venezuela, and Dr. D.E. Stuntz and Dr. G.A. Escobar from the University of Washington at Seattle, for critical review of this paper.

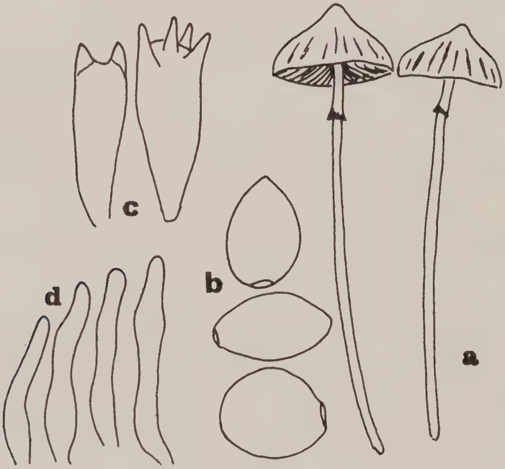
Panaeolus venezolanus Guzmán, sp. nov. Figs. a-d

Pileo 20-35 mm lato, campanulato, brunneo-griseo vel cinereo. Lamellis sinuatis, griseo-atris et maculatis. Stipite 45-50 x 2-3 mm, cylindrato, subbulboso, cavo, rufo-brunneo, pruinoso. Annulo conspicuo, membranaceo vel caduco, nigro. Sporis (11-) 12-14.8 x 8.8-9.9 x 7.7-8.5 um, citriformi - ovatis, nigro-brunneis, poro germinali visibli. Basidiis 2-4-sporis, subcylindratibus. Pleurocystidiis nullis. Cheilocystidiis 24.7-34.5 x 6-9 um, subcylindratibus, hyalinis. Trama hyalina, hyphis cum fibulis. Hyphis pilei subfusiformibus vel subcylindricibus fulvis, 11-49 x 7-11 um. Specie subfimicaria vel fimicaria, gramnicola. Typus: Guzmán 9177 (MER), San Javier del Valle, circa Mérida, Venezuela.

Pileus 20-35 mm in diam, subcampanulate to campanulate, smooth to irregularly rimose, dry, brownish gray to ashy gray. Lamellae sinuate, blackish-gray but mottled. Stipe 45-50 x 2-3 mm, cylindric but subbulbous, hollow, brownish gray to reddish, pruinose toward the base. Annulus membranaceous, thin, whitish to blackish from spores deposited. Context thin, grayish at pileus, brownish at stipe, with taste and odor slightly farinaceous. Spores (11-) 12-14.8 x 8.8-9.9 x 7.7-8.5 um, limoniform to subovate, with broad germ pore and thick wall, brownish to dark brown or blackish (KOH). Basidia 21.7-30 x 9-11.2 um, two- or four-spored, subcylindric or subpyriform, hyaline. Pleurocystidia none. Cheilocystidia 24.7-34.5 x 6-9 um, hyaline, subcylindric or vesiculose-elongated, abundant. Subhymenium and trama hyaline. Epicutis dry, formed by brownish (KOH) vesiculose-cylindric elements emerging from the surface. Hypodermium hyaline. Clamp connections present but scarce.

Habitat and distribution. Gregarious on cow dung or on rich soils, in meadows of the subtropical forests. Known from Venezuela and possibly also present in subtropical and tropical regions of Mexico.

Studied material. VENEZUELA, N of Mérida, San Javier del Valle, July 27, 1971, Guzmán 9177 (Type, MER; Isotype, ENCB).



Figs. a-d. Panaeolus venezolanus Guzmán. a: Two fruiting bodies. b: Three spores. c: Two basidia. d: Four cheilocystidia (all from the type)

Discussion. The well developed annulus in the adult fruiting bodies is a good feature to separate this species from all others known in the genus. It is rather close to P. sphinctrinus (Fr.) Quél., but the rimose pileus, the size of the spores, and the presence of an annulus separate it from that species. P. sphinctrinus does not have a ring, and the pileus is smooth. Its spores according to Singer (1960) are 12.5-14.5 x 8-10 um; according to Ola'h (1969) are 14.5-18 x 10.5-12.6 um, and according to Kühner & Romagnesi (1953) are 14-18 x 10-12 um. Guzmán and Pérez

Patraca (1972) reported two groups of _P. sphinctrinus_ from México, one with spores 12-16.8 x 8.4-12 um and another with spores 14-18.2 x 9.8-13.5 um, and as they mentioned, it seems that there is one _P. sphinctrinus_ in tropical and subtropical regions with small spores and another in temperate regions with large spores. _P. venezolanus_ is close to that from the tropics and subtropics. The author even had observed some "_P. sphinctrinus_" with an annulus in the tropics of México, but unfortunately he did not study them.

Another species of _Panaeolus_ close to _P. venezolanus_ is _P. phalaenarum_ (Fr.) Quél. sensu Singer (1969), reported from Chile and Europe, which also has a veil that remains as a narrow annular belt, but has spores of 13.5-17 x 5.5-11.5 x 7.7-9.4 um. _P. semiovatus_ (Sow ex Fr.) Lund. et Nannf. (= _Anellaria_, Pearson and Dennis), a well known annulate species of the alpine or paramo vegetation, is distinguished from _P. venezolanus_ by the white fruiting body as well as by the chrysocystidia and size of the spores.

_P. acuminatus_ (Schaeff. ex Sécr.) Quél., _P. antillarum_ (Fr.) Dennis, _P. convexulus_ Sing., _P. cyanescens_ (Berk. & Br.) Sacc., _P. foenisecii_ (Pers. ex Fr.) Kühn., _P. moellerianus_ Sing., _P. papilionaceous_ (Bull. ex Fr.) Quél., _P. retirugis_ (Fr.) Gill., _P. rickenii_ Hora, _P. sphinctrinus_ var. _minor_ (Fr.) Sing., _P. subbalteatus_ (Berk. & Br.) _P. uliginicola_ (Speg.) Sacc., _P. variabilis_ Overh., _P. venezolanus_, and the three species discused above, are the known species of _Panaeolus_ from South America, according to the revised literature (Dennis, 1970; Restrepo, 1972; Singer, 1960, 1969, and Singer & Digilio, 1951).

This species, together with other _Panaeolus_ spp. and _Psilocybe cubensis_ (Earle) Sing. is used by the students in Mérida, Venezuela, as a drug that provokes gastrointestinal intoxication, as the author observed in the field and as reported by Llorca Izquierdo (1972).

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# THE SPECIES OF PSILOCYBE KNOWN FROM CENTRAL AND SOUTH AMERICA

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## SUMMARY

There are 66 species of Psilocybe known from Central and South America (excluding Mexico) of which 15 new species, one new combination and 5 new records are discussed. The hallucinogenic species are 30 but 7 are doubtful. Two of the new species described here also grow in the U.S.A. and in Mexico (P. moelleri Guzmán and P. subcubensis Guzmán).

## INTRODUCTION

Central and South America have a very rich mycoflora. Spegazzini (1898, 1919), Rick (1961), Singer (1953, 1959, 1960, 1969, 1973), Singer and Digilio (1951), Singer and Smith (1958), Dennis (1970), and Horak (1967) described numerous agarics, including 45 species of Psilocybe. However further research into this genus would be of great value.

In the present paper I have described 15 new species and one new combination, as well as 5 species are reported here for the first time from Central and South America, but 7 are reported for the first time from several countries of Central and South America. This paper is based on material collected by the author during his trips in 1964, 1971 and 1976 to Colombia, Venezuela, Brazil, Peru, Uruguay and Argentina, as well as on material collected by Spegazzini, Rick, Singer, Horak, and Dumont, deposited in the herbaria LPS, BAFC, PACA, SGO and NY. Microscopic sections of all the specimens were mounted in KOH (5%) and the colors of the spores, hyphae and cystidia are described accordingly. In table 1 the 66 known species of Psilocybe from Central and South America are shown. In table 2 the species described or discussed in the present paper are arranged by countries. In both tables, species marked with an asterisk are hallucinogenic. For practical purposes, species considered are in alphabetic order. This paper is to be considered a precursor of a monograph on Psilocybe in preparation by the author.

## DISCUSSION OF THE NEW RECORDS AND DESCRIPTION OF 15 NEW SPECIES OF PSILOCYBE

### Psilocybe acutipilea (Speg.) Guzmán, new comb.
=Deconica acutipilea Speg., Bol. Acad. Nac. Cs. Córdoba 11: 381. 1889.

Pileus 7-10 mm diam., globose-conic to conic-papillate, smooth to somewhat striate at the margin, hygrophanous (?), brown to brownish, viscid (?). Lamellae subadnate or sinuate, brownish chocolate with whitish edges. Stipe 50 x 1-2 mm, cylindric, hollow, flexuosus, whitish to yellowish, covered by floccose white fibrils (it seems to stain blue when injured). Context whitish; odor and taste unknown.

Spores (7-) 8-9.5 (-11) x 5-6 (-7) x 4-5 µm, subrhomboid in face view, elliptic or subelliptic in side view, thick walled, brownish yellowish, with a broad basal germ pore. Basidia and pleurocystidia not observed (hymenium collapsed) (it is possible that there are no pleurocystidia). Cheilocystidia 15-28 x 5-8 µm, hyaline, abundant, vesiculose-pyriforme with long neck 8-10 x 1-2 µm, forming a more or less sterile band at the edge of the gill. Subhymenium and trama brownish yellowish with hyphae collapsed. Epicutis subgelatinized with hyaline elongated hyphae.

Habitat. Solitary on humus in subtropical forests. known only from the type locality.

Studied material. BRAZIL, Apiaí (Apiahy), Autumm 1881, Spegazzini 1536 (LPS 38307 type).

Discussion. This species is close to P. mexicana Heim and P. caerulescens Murr., and seems to be intermediate between them. The size of the spores and the cheilocystidia serves to separate P. acutipilea from the other two species (see Guzmán 1977-B). It is possible that this species has hallucinogenic properties because of its relationship with those mentioned above that they are use by the Mexican indians as psychotropic fungi.

### Psilocybe aggericola Singer & Smith

This hallucinogenic species was described (Singer & Smith, 1958) from Argentina, Prov. Tucumán, road to Tafí del Valle, near Monumento al Indio, and is only known from the type locality. However the study of the type (Singer T-760, MICH) by the author shows that this species is very close to P. zapotecorum Heim emend. Guzmán, because has spores thin walled and pleurocystidia hyaline to brownish or opaque.

TABLE 1. THE KNOWN SPECIES OF PSILOCYBE FROM CENTRAL AND SOUTH AMERICA AND ITS ECOLOGICAL DISTRIBUTION

| SPECIES | ECOLOGICAL ZONES 1 | 2 | 3 | 4 | COUNTRIES |
|---|---|---|---|---|---|
| ?* P.ACUTIPILEA (Speg.) Guzmán | X | | | | Brazil |
| * P.AGGERICOLA Sing. & Smith | | X | | | Argentina |
| P.ALNETORUM (Sing.) Sing. | | X | | | Argentina<br>Ecuador |
| P.ANDINA Guzmán | | | | X | Venezuela |
| P.angulata (Pers.) Sing. | | | X | | Chile |
| ?* P.araucana Sing. | | X | | | Argentina |
| P.ARGENTINA (Speg.) Sing. | | X | X | X | Argentina<br>Colombia<br>Venezuela |
| ?* P.BLATTARIOPSIS (Speg.) Sing. | | X | | | Brazil |
| * P.BRASILIENSIS Guzmán | | X | | | Brazil |
| P.bullacea (Bull. ex Fr.) Kumm. | | | | X | Colombia |
| * P.CAERULEOANNULATA Sing. ex Guzmán | | X | | | Brazil<br>Uruguay |
| * P.CAERULESCENS Murr. | | X | | | Panama<br>Venezuela |
| * P.caesioannulata Sing. | | X | | | Chile |
| ?* P.callosa (Fr. ex Fr.) Quél. | | X | | | Chile |

1: Tropical zone; 2: Subtropical zone (with deciduous forests toward the mountains at 1000-2000 m alt.); 3: Temperate zone; 4: Páramos (vegetation of the high mountains). Those fungi marked with an asterisk are hallucinogenic. The species with capitals are discussed in this paper.

Cont. Table 1

| SPECIES | ECOLOGICAL ZONES 1 | 2 | 3 | 4 | COUNTRIES |
|---|---|---|---|---|---|
| ?* P. carbonaria Sing. | | X | | | Chile |
| P. chilensis Sing. | | | X | | Chile |
| P. chrysocystidiata Sing. | | X | | | Bolivia |
| * P. COLUMBIANA Guzmán | | | | X | Colombia |
| * P. collybioides Sing. & Smith | | X | | | Argentina |
| P. COPROPHILA (Bull. ex Fr.) Kumm. | X | X | X | | Ecuador<br>Panama |
| P. cordobensis Sing. | | X | | | Argentina |
| * P. CUBENSIS (Earle) Sing. | X | X | | | Argentina<br>Brazil<br>El Salvador<br>Peru<br>Venezuela |
| * P. DUMONTII Sing. ex Guzmán | | X | | | Panama |
| P. dunicola (Speg.) Sing. | | | X | | Argentina |
| * P. FARINACEA Rick ex Guzmán | | X | | | Brazil |
| P. FIMICOLA Guzmán | | | | X | Colombia |
| P. flammuliformis Sing. | | | X | | Chile |
| P. fuegiana (Horak) Sing. | | | X | | Argentina |
| * P. FURTADOANA Guzmán | | X | | | Brazil |
| P. heterosticha (Fr.) Sing. | | | X | | Argentina |
| * P. HOOGSHAGENI Heim | | X | | | Argentina |
| P. HORAKII Guzmán | | X | | | Argentina |
| P. inquilina (Fr. ex Fr.) Bres.<br>= P. ecbola (Fr.) Sing. | | X | X | | Argentina<br>Chile<br>Uruguay |
| P. jujuyensis Sing. | | | X | | Argentina |
| P. lazoi Sing. | | | X | | Chile |
| P. marthae Sing. | | | X | | Chile |

Cont. Table 1

| SPECIES | ECOLOGICAL ZONES | | | | COUNTRIES |
|---|---|---|---|---|---|
| | 1 | 2 | 3 | 4 | |
| P. MERDARIA (Fr.) Ricken | | X | X | | Argentina<br>Brazil ?<br>Uruguay ?<br>Venezuela |
| P. mesospora Sing. | | | X | | Argentina |
| P. MOELLERI Guzmán | | X | X | | Argentina<br>Chile<br>Peru |
| P. MONTANA (Pers. ex Fr.) Kumm | | | X | X | Chile<br>Colombia<br>Venezuela |
| P. omniumsanctorum Sing. | | | X | | Argentina<br>Chile |
| P. PANAEOLIFORMIS Murr. | | | | X | Ecuador |
| * P. paupera Sing. | | X | | | Brazil |
| P. peladae Sing. | | | X | | Chile |
| * P. pelliculosa (Smith) Sing. & Smith (= P. semilanceata var. microspora Sing.) | | | X | | Chile |
| P. peruviana Sing. | | | X | | Peru |
| * P. PINTONII Guzmán | | | | X | Colombia |
| * P. plutonia (B. & C.) Sacc. | | X | | | Venezuela |
| P. praetervisa Sing. | | | X | | Argentina |
| P. pteridophytorum Sing. | | X | | | Argentina |
| ?* P. sclerotifera (Speg.) Sing. | | X | | | Argentina |
| * P. semilanceata (Secr. ex Fr.) Kumm. | | X | | | Chile |
| P. septembris (Sing.) Sing. | | | X | | Chile |
| * P. sierrae Sing. | | X | | | Chile |
| P. squarrosipes Sing. | | X | | | Argentina |

Cont. Table 1

|  | SPECIES | ECOLOGICAL ZONES |  |  |  | COUNTRIES |
|---|---|---|---|---|---|---|
|  |  | 1 | 2 | 3 | 4 |  |
|  | P. subcoprophila (Britz.) Sacc. |  |  | X |  | Argentina<br>Chile |
| * | P. SUBCUBENSIS Guzmán | X | X |  |  | Mexico<br>Colombia<br>Honduras<br>Bolivia<br>Ecuador<br>Venezuela |
|  | P. subhyperella Sing. |  | X |  |  | Colombia |
| * | P. SUBYUNGENSIS Guzmán |  | X |  |  | Venezuela |
|  | P. TORTIPES Speg. (= Naematoloma tortipes (Speg.) Guzmán) |  | X |  |  | Argentina |
| ?* | P. URUGUAYENSIS Sing. ex Guzmán |  |  | X |  | Uruguay |
|  | P. valdiviensis Sing. |  |  | X |  | Chile |
|  | P. venezuelana Dennis |  | X |  |  | Venezuela |
| * | P. WRIGHTII Guzmán |  | X |  |  | Argentina |
| * | P. YUNGENSIS Sing. & Smith = P. yungensis var. diconica Sing. & Smith |  | X |  |  | Bolivia |
| * | P. zapotecorum Heim emend. Guzmán |  | X |  |  | Brazil<br>Peru |

TABLE 2

## DISTRIBUTION BY COUNTRIES OF THE SPECIES OF PSILOCYBE DISCUSSED IN THIS PAPER

- HONDURAS
  - * *P. subcubensis* Guzmán
- PANAMA
  - * *P. caerulescens* Murr.
  - *P. coprophila* (Bull. ex Fr.) Kumm.
  - * *P. dumontii* Sing. ex Guzmán
- COLOMBIA
  - *P. argentina* (Speg.) Sing.
  - *P. bullacea* (Bull. ex Fr.) Kumm.
  - * *P. columbiana* Guzmán
  - *P. fimicola* Guzmán
  - *P. montana* (Pers. ex Fr.) Kumm.
  - * *P. pintonii* Guzmán
  - * *P. subcubensis* Guzmán
- VENEZUELA
  - *P. andina* Guzmán
  - *P. argentina* (Speg.) Sing.
  - * *P. caerulescens* Murr.
  - *P. merdaria* (Fr.) Ricken
  - *P. montana* (Pers. ex Fr.) Kumm.
  - * *P. subcubensis* Guzmán
  - * *P. subyungensis* Guzmán
- ECUADOR
  - *P. alnetorum* (Sing.) Sing.
  - *P. coprophila* (Bull. ex Fr.) Kumm.
  - *P. panaeoliformis* Murr.
  - * *P. subcubensis* Guzmán
- PERU
  - *P. moelleri* Guzmán
  - * *P. zapotecorum* Heim
- BOLIVIA
  - * *P. subcubensis* Guzmán
  - * *P. yungensis* Sing. & Smith
- BRAZIL
  - ?* *P. acutipilea* (Speg.) Guzmán
  - * *P. brasiliensis* Guzmán
  - * *P. caeruleoannulata* Sing. ex Guzmán
  - * *P. cubensis* (Earle) Sing.
  - * *P. farinacea* Rick ex Guzmán
  - * *P. furtadoana* Guzmán
  - *P. merdaria* (Fr.) Ricken ?
  - * *P. zapotecorum* Heim
- URUGUAY
  - * *P. caeruleoannulata* Sing. ex Guzmán
  - *P. merdaria* (Fr.) Ricken ?
  - ?* *P. uruguayensis* Sing. ex Guzmán
- CHILE
  - *P. moelleri* Guzmán
  - *P. montana* (Pers. ex Fr.) Kumm.

ARGENTINA

- * _P_. _aggericola_ Sing. & Smith
- _P_. _alnetorum_ (Sing.) Sing.
- _P_. _argentina_ (Speg.) Sing.
- _P_. _blattariopsis_ (Speg.) Sing.
- * _P_. _cubensis_ (Earle) Sing.
- * _P_. _hoogshageni_ Heim
- _P_. _horakii_ Guzmán
- _P_. _merdaria_ (Fr.) Ricken
- _P_. _moelleri_ Guzmán
- _P_. _tortipes_ Speg.
  - = _Naematoloma tortipes_ (Speg.) Guzmán
- * _P_. _wrightii_ Guzmán

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## _Psilocybe alnetorum_ (Sing.) Sing.

This species was known previously only from Argentina (Singer & Digilio, 1951; Singer 1959). The author identified the species in material from ECUADOR: 36 km from Quito, road to Tandayapa, Prov. Pichincha, at 2400 m elevation on bamboo culm: Dumont EC-2297, Aug. 6, 1975 (NY). The Ecuatorian material agrees well with the type (BAFC). The spores are (5.5-) 6-7 (-8) x 4.4-5 x 3.8-4.4 µm, pleurocystidia 22-39 x 7.7-12 µm, mucronate, hyaline but sometimes with a refringent central mass, and with hyaline cheilocystidia 13-19 x 5-7.7 µm, fusiform or short mucronate. The fruit body is collybioid, 5-10 mm in diameter.

## _Psilocybe andina_ Guzmán, sp. nov.

_A Psilocybe montana differt praesentia annuli in maturis, Ad terram muscosam in paramo. Sierra Nevada de Santo Domingo, Laguna de Mucubaji, VENEZUELA, Guzmán 9232 (MER) typus_.

Pileus 5-10 mm diam., convex or subcampanulate, smooth, slightly striate, transparent at the margin when wet, subviscid or lubricous to dry; hygrophanous, reddish brown, fading to brownish or clay color or straw color. Lamellae broadly adnate to somewhat decurrent, brownish to brown-violet with edges concolorous or whitish and floccose. Stipe 20-30 x 0.5-1.5 mm, cylindrical or attenuate towards the apex, hollow, whitish above to reddish brown below, finally all over covered with fibrillose of floccose white spots. Annulus well developed, whitish, membranous to fibrillose or floccose. Context thin, yellowish, without any taste or odor. Spore print dark violaceous brown.

Spores (6.6-) 7.7-8.8 (-9.9) x 5-5.5 (-6) x 3.3-5 µm, subrhomboid or sublentiform in face view, ellipsoid or ovoid-ellipsoid in side view, with thick wall, brownish or yellowish brown and broad germ pore. Basidia 16-22 x 6-7 µm, two or four-spored, vesiculose or subpyriform. Pleurocystidia none. Cheilocystidia 15-30 x 4.4-5.5 µm, ampullaceous with long neck 2-3.3 µm diam., hyaline, abundant; sometimes with an oil drop at the apex. Subhymenium formed by subglobose hyaline elements, strongly irregularly incrusted with brown yellow pigment on the walls. Trama regular, hyaline or brownish, incrusted with scarce pigment. Epicutis subgelatinized, formed by elongated, thin, hyaline to brownish hyphae. Hypodermium like as the subhymenium. Clamp connections present.

Habitat. Gregarious on soil covered by mosses (*Polytrichum*), in páramos with *Espeletia* at 3600 m elevation. Known only from the type locality.

Studied material. VENEZUELA, Parque Nacional Sierra Nevada de Santo Domingo, Laguna de Mucubaji, Jul. 28, 1971, Guzmán 9232 (MER Holotype, ENCB Isotype).

Discussion. The well developed annulus in the adult carpophores is the principal feature distinguishing this species from *P. montana*, a very closely related species. It is interesting to observe that *P. montana* grows more frequently in lower and warmer lands than *P. andina*. Thus it seems that the well developed veil helps to protect the hymenium in the young stages. The same observation can be made for *Panaeolus semiovatus* (Sow. ex Fr.) Lund ex Nannf. and *P. antillarum* (Fr.) Dennis, the first with annulus and characteristic of the high mountains and the latter without annulus and only common in tropical and subtropical regions.

## *Psilocybe argentina* (Speg.) Sing.

This coprophilous species was until recently known only from Argentina (Singer, 1969). It occurs in the south of Argentina and in the high mountains of Mexico (Guzmán *et al.*, 1977). It differs from *P. coprophila* (Bull. ex Fr.) Quél. only in the size of the spores. *P. argentina* has spores (11-) 12-15 (-16) µm long, as the author observed in the type (LPS) and in the material from Venezuela and Colombia from where it is here reported for the first time.

Studied material. VENEZUELA, Parque Nacional Sierra Nevada, Teleferico de Mérida, Station La Aguada, July 29, 1971, 3200-3400 m elevation, páramo with *Espeletia*: Guzmán 9245 (MER). COLOMBIA, Dept. Boyacá, road between Aquitamia and the crossing of Sogamoso to Aguazul, June 12, 1976: Dumont CO-4951 (NY). Road Choconta to Aguaclara, June 10, 1976, 1400 m elevation: Dumont CO-4600 (NY). Dept. Chocó, near Ansermanuevo, road to San José del Palmar, Aug. 27, 1976, 1900 m elevation: Dumont CO-7451 (NY).

## *Psilocybe blattariopsis* (Speg.) Sing.

This species described by Spegazzini as *Pholiotella blattariopsis* Speg. from Brazil (Apiaí), and only known from the type locality, has brownish pleurocystidia (in KOH), according to the study of the type (Puiggari 1535,LPS 1333), feature not considered by Singer (1950). It is close to *P. subaeruginosa* Clel. from Australia and to *P. uspanapensis* Guzmán from Mexico for the brownish pleurocystidia, but the spores are subrhomboid, (8.4-) 9.6-10.8 (-13.2) x (6.6-) 7.2-9.6 (-10) x 5.5-7.2 µm, with thick wall, like to those of *P. uruguayensis* Sing. ex Guzmán.

## *Psilocybe brasiliensis* Guzmán, sp. nov.

*Pileo 12-30 mm lato, convexo vel conico vel campanulato, hygrophano, rufobrunneo vel alutaceo. Lamellis adnatis fuscosapiaceis. Stipite 35-80 x 1-4 mm, carneo-albido dein cum pileo subconcolori, basi strigosissima. Carne caerulescente, odore farinaceo. Sporis (5.6-) 6.6-7.1 (-7.7) x 4.9-5.5 (-6) x 4.2-5 µm, sublentiformibus. Pleurocystidiis 22-29 x 8.8-12 µm, hyalinis, vesiculose fusiformibus vel sublageniformibus. Cheilocystidiis 9.6-13.2 x 4.8-7.2 µm, lageniformis. Epicute subgelatinascente. Ad terram in silvis Araucariae et Podocarpi. Parque Forestal del Estado Sao Paulo, Brasil, Guzmán 8920 (SP), Typus.*

Pileus 12-30 mm diam., convex or conical to subcampanulate, smooth, striate toward the margin when moist,lubricous, hygrophanous, reddish brown to alutaceous. Lamellae adnate or subadnate, brownish to fuscous sepia, with whitish edges. Stipe 35-80 x 1-4 mm, cylindrical or rarely subbulbous, whitish to almost concolorous with pileus, hollow, covered toward the base with whitish fibrils of the veil, sometime with a rhizomorphic prolongation. Veil white, fugacious on pileus, but sometimes persistent on the upper part of the stipe as a white floccose annular zone. Context whitish and fleshy in pileus, reddish brown and fibrous-hard in the stipe; odor and taste farinaceous, readily staining blue when injured, but only slightly so in the stipe. KOH stains all parts yellow-brown. Spore print dark grayish violet.

Spores (5.6-) 6.6-7.1 (-7.7) x 4.9-5.5 (-6) x 4.2-5 µm, subrhomboid in frontal view or subelliptic in lateral view, yellowish brown, smooth, thick walled, with a broad germ pore. Basidia 18-27 x 6.6-8.4 µm, four-spored, hyaline, subvesiculose. Pleurocystidia 22-29 x 8.8-12 µm, hyaline, vesiculose, fusoid or sublageniform. Cheilocystidia 9.6-13.2 x 4.8-7.2 µm, forming a sterile band at the edge of the gill, hyaline, lageniform. Subhymenium arranged by globose subhyaline elements with a reddish brown to gray blue pigment. Trama regular, hyaline or yellowish with elongated hyphae 4-10 µm diam., thin walled (wall 0.5-1 µm thick), with clamps. Epicutis a cutis more or less gelatinized, with brownish, parallel, thin hyphae. Hypodermium hyaline or yellowish with parallel elongated hyphae 5-13 µm diam., thin walled.

Habitat. Gregarious on grassy soil (Anonopus compressus) in forest of Araucaria brasiliana and Podocarpus. Known only from the type locality.

Studied material. BRAZIL, Parque Forestal del Estado de Sao Paulo, 10-13 km E of Campus de Jardao, near Rio Sapucaiguasu, 1500 m elevation, March 8, 1971, Guzmán 8920 (holotype SP, Isotype ENCB); other collections from the same locality are Guzmán 8922 & 8929 in ENCB and SP.

Discussion. This species is close to P. caerulescens, but the thin and long stipe, the rhizomorphic base, as well as the form and size of the pleurocystidia and cheilocystidia are well defined features which separate it. Its bluing as well as its odor and favor, indicate that this species has hallucinogenic propierties.

### Psilocybe bullacea (Bull. ex Fr.) Kummer

This species had been interpreted by several authors in different ways. It is close to P. montana (Pers. ex Fr.) Kumm. and P. coprophila (Bull. ex Fr.) Kumm., but differs from the first in having a well developed veil which sometimes forms an ephemerous annulus, in having floccose stipe, in growing on rich soil or on dung an in presenting a hyaline or slightly pigmented subhymenium, as the author has observed when studying European collections. With P. coprophila differs in the size of the spores (see P. coprophila in this paper). The first South America report of P. bullacea is from COLOMBIA: Dumont CO-5037 (NY), on rich soil or dung, road Sogamoso-Aguazul, intersection with Alquitama road, Dept. Boyaca, June 13, 1976. This material has spores (5.5-) 6-7.1 (-8) x 4.5-6 x 3.8-4.4 µm, yellowish brown, subhexagonal, with cheilocystidia lageniform forming a sterile band at the edge of the gill, 20-33 x 5-6 um, with a long neck 1.5-2.5 µm across; there are no pleurocystidia. The fruit bodies are small (pileus no more than 10 mm diam.) with broad, adnate lamellae.

### Psilocybe caeruleoannulata Sing. ex Guzmán
= Stropharia siccipes Karst. var. lugubris Rick, Lilloa 4:83, 1939

Pileo 19-22 mm lato, convexo vel conico, papillato, hygrophano, rufobrunneo vel alutaceo. Lamellis sinuato-adnatis, glaucis. Stipite 25-45 x 1-2 mm, carneo-albido vel fulvo. Annulo conspicuo, membranaceo, albo, caerulescente, caduco. Carne subcaerulescente, odore leniter farinaceo. Sporis (8.8-) 9.9-11 (-12) x 6-6.6 (-7.1) x 5.5-6 µm, sub-

*rhomboideis. Pleurocystidiis nullis. Cheilocystidiis 17-20 x 5-6 µm, lageniformis. Epicute gelatinascente. Ad terram, graminicola aut in paludosi, extra silva. Maldonado, Uruguay, Singer B-4172 (BAFC), typus.*

Pileus 10-22 mm diam., convex or conical to papillate, smooth, transparently striate at the margin when moist, viscid, hygrophanous, reddish brown to faded sordid pallid chamois with brownish buff to alutaceous center; pellicle separable. Lamellae sinuate-adnate or subadnate, grayish violet but with whitish edges when young. Stipe 25-45 x 1-2 mm, whitish from a silky appressed covering over a gray background, becoming grayish cinereous where touched; at base soon caesious, slightly and gradually tapering upwards. Veil well formed; annulus membranous but thin, smooth, white, slightly staining blue, fragile but usually persistent. Context pallid in pileus, grayish to brownish in stipe; odor none or slightly farinaceous; taste slightly farinaceous. Spore print deep violaceous.

Spores (8.8-) 9.9-11 (-12) x 6-6.6 (-7.1) x 5.5-6 µm, subrhomboid frontally, subelliptic in profile, yellowish brown, smooth, more or less thin walled but with complex wall and with broad truncate germ pore. Basidia 15-22.4 x 7.5-9.8 µm, four-spored, hyaline, subvesiculose. Pleurocystidia none. Cheilocystidia 17-20 x 5-6 µm, forming a sterile band on the edge of the gill, hyaline, lageniform or vesiculose-ventricose, the neck 5-8.5 x 1-2 µm, sometimes with an oily hyaline drop at the apex. Subhymenium with parallel, brownish, thin (4 µm diam.) hyphae. Trama regular, brownish or hyaline, with chestnut incrusted hyphae, 12-20 µm diam., thin walled. Clamp connections present. Hypodermium with interwoven brownish hyphae which are broader on the average than those of the epicutis, not subcellular, but in the context below often more pigmented and darker, more irregular and with quite a few rather short elements. Epicutis hyaline, a 50-60 µm thick layer of strongly gelatinized hyaline, filamentous hyphae 0.5-2.2 µm thick.

Habitat. On marshy ground or in grasslands outside the forests of *Araucaria* and *Podocarpus*, in pasture land, sometimes on dung. Known from Brazil and Uruguay.

Studied material. BRAZIL, State of Sao Paulo, near Campos de Jardao, March 8, 1971, 1600 m elevation, Guzmán 8877 (ENCB; SP). Guzmán 8916 (ENCB; SP). Santa María, 1936, Rick (PACA 15234, Type of *Stropharia siccipes* var. *lugubris* Rick). Sao Leopoldo, 1934, Rick (PACA 9362, as *Stropharia inuncta*). Without locality: Rick (Herb. Bresadola 287; NY, as *Stropharia luteonitens*). URUGUAY, Maldonado, May 27, 1966, Singer B-4172 (BAFC Holotype).

Discussion. *P. caeruleoannulata* is close to *P. stuntzii* Guzmán & Ott and *P. uruguayensis* Sing. ex Guzmán, but differs in the shorter cheilocystidia (*P. stuntzii* has cheilocystidia 22-27.5 µm long and *P. uruguayensis* 24.5-32 µm long). This species was named by Singer in the herbarium BAFC based on the collection from Uruguay. Later the author of the present paper collected the same fungus in Brazil and found the species in the herbarium PACA as *Stropharia siccipes* Karst. var. *lugubris* Rick, a variety described in 1939 but not considered in Rick's later papers (1961); this material agrees well with the type of *P. caeruleoannulata*; the variety of Rick is considered synonymous. Bresadola confused *P. caeruleannulata* with *P. luteonitens* (Vahl ex Fr.) Parker-Rhodes, as the author noted in one of Rick's collections (NY), identified by Bresadola as *P. luteonitens*, but this species has spores 15.4-18.7 (-20) x 11-13.2 x 9.9-11 µm.

### *Psilocybe caerulescens* Murr.

This well known hallucinogenic species, described from Alabama, U.S.A., and reported from Mexico (Heim & Wasson, 1958 and Singer & Smith, 1958) is here reported for first time from Panama and Venezuela. The Central and South American collections agree well with the type (NY). They were collected on orange reddish clay soil similar to the Mexican localities. The spores are subrhomboid or elliptic, (5.5-) 6-7 (-7.7) x (4.4-) 4.5-5.5 (-5.8) x 4-4.5 µm, pleurocystidia absent, cheilocystidia lageniform or filamentous, 12-20 x 3-4.4 (-5.5) µm; the carpophore is strong caerulescent, even in the hyphae of the subhymenium which are blue green in KOH.

Studied material. PANAMA, Prov. Veragas, Santa Fe to Calovibora, atlantic slope, vicinity Rio Caloviborita, June 18, 1975. Dumont PA-570 (NY). VENEZUELA, State of Sucre, Mundo Nuevo to Mancal road, NW of Irapa, July 7, 1972, Dumont VE-4145 (NY).

*P. caerulescens* is close to *P. wrightii* Guzmán and *P. farinacea* Rick ex Guzmán (see discussion under these species).

### *Psilocybe columbiana* Guzmán, sp. nov.

*Pileo 6-19 mm lato convexo vel campanulato, hygrophano, rufobrunneo vel fulvo vel albolutescente. Lamellis adnatis, ochraceo-violacei. Stipite 20-60 x 1-3 mm, clarobrunneo, fibrilloso vel fulvo. Annulo nullo. Carne caerulescente, odore et sapore farinaceis. Sporis (6.6-) 7.1-8.8 x (4.9-) 6-6.6 (-7.1) x 4.4-5.5 µm, sublentiformibus vel elongato-ellipsoideis. Pleurocystidiis nullis. Cheilocystidiis 22-30 x 3.3-6.5 µm, lageniformibus. Epicute subgelatinascente. Ad terram argillaceam expers herbis destitutam in paramo. Espeletiae grandifoliae. Represa del Rio Neusa-Torre de Transmision de TV, Municipio Tansa, Cundinamarca, Colombia, Guzmán 9146 (COL) typus.*

Pileus 6-19 mm diam., convex to campanulate, smooth to slightly rimose, faintly striate and transparently when moist, lubricous, hygrophanous, brown reddish to yellow reddish, finally yellow whitish. Lamellae adnate or subadnate, ochre violaceous, with whitish edges. Stipe 20-60 x 1-3 um, cylindrical, sometimes sinuous, hollow, white to brown reddish, covered with floccose white fibrils, sometimes with a rhizomorphic white prolongation in the soil, up to 20 mm long. Veil white and floccose, distinct annulus absent. Context white in pileus, concolorous with pileus in stipe, staining blue when cut. Odor and taste farinaceous. Spore print violet brown to almost black.

Spores (6.6-) 7.1-8.8 x (4.9-) 6-6.6 (-7.1) x 4.4-5.5 µm, subrhomboid in frontal view, subelliptic in lateral view, light brownish chocolate or yellowish brown, smooth, thin walled, with a broad germ pore. Basidia 15-27 x 4.4-8 µm, four-spored, hyaline, vesiculose or subpyriform. Pleurocystidia none. Cheilocystidia 22-30 x 3.3-6.5 µm, abundant, forming a sterile band at the edge of the gills, hyaline, lageniform or fusoid-ampullaceous and mucronate, sometimes branched; the neck 1.6-2.2 µm across. Subhymenium formed by subglobose, subhyaline elements with yellowish brown irregularly incrusting pigment. Trama regular, hyaline, with elongate hyphae 15-25 µm diam. with thin wall (1.5 µm thick). Epicutis subgelatinized, with brownish or hyaline hyphae 2-6 µm broad. Clamp connections present.

Habitat. On clay black soils without herbaceous vegetation, sometimes living together with Aleuria aurantia (Pers. ex Fr.) Fuck., in páramos of Espeletia argentea at 3300-3500 m elevation. Known only from the type locality.

Studied material. COLOMBIA, Department of Cundinamarca, Municipio of Tansa, road La Represa del Río Neusa to la Torre de Transmisión de TV, July 24, 1971. Guzmán 9146 (Holotype COL; Isotype ENCB); other collections from the same locality are Guzmán 9145. 9156; 9158 (all in ENCB and COL).

Discussion. P. columbiana belongs to the P. zapotecorum group because of its spores and floccose stipe, but differs in the size of the spores and form of the cheilocystidia. It is a hallucinogenic species since it stains blue and has a farinaceous taste and odor.

### Psilocybe coprophila (Bull. ex Fr.) Kumm.

This common non-hallucinogenic species, with spores of (9-) 10-12 (-14) x (6-) 7-9 x 6-7.1 µm, is here reported for the first time from Ecuador and Panama. It is close to P. argentina (Speg.) Sing. and P. panaeoliformis Murr. See discussion of these.

Studied material. ECUADOR, road to Loja, 12 km from Zamora, Aug. 1, 1975, Dumont EC-1886 (NY). PANAMA, Prov. Chiriqui, road El Alto del Volcan to Cerro Punta, near Aguacate, July 4, 1975, Dumont PA-2117 (NY).

### Psilocybe cubensis (Earle) Sing.

The type (Earle 109, NY) of this hallucinogenic mushroom has spores (12-) 13.2-15.4 (-17.6) x 7.7-9.9 (-11) x 7-8.8 µm and sometimes up to 19 um long. But Singer & Smith (1958) reported for this species spores 11.5-17.3 x 8-11.5 x 7-9 µm and Heim (in Heim & Wasson, 1958) 11.8-15 x 8.8-10 x 7.8-8.8 µm for Mexican materials and 13-16.2 µm, 13-18 um, 12.5-15.8 µm, and 12-16 um long for Asiatic materials. All the Mexican materials studied by the present author have spores (9.9) 11-13 (-14) x 7.7-8.8 x 6.6-7.1 µm, and so have some materials from Colombia, Ecuador and Venezuela. Thus, there are two groups of fungi, one with large spores as the type, the other with small spores. The author considers the group of fungi with small spores to belong to another species, that here is described as new (see P. subcubensis Guzmán below). On the other hand the types of Naematoloma caerulescens Pat. from Indochina (FH) and Stropharia cyanescens Murr. from Florida, U.S.A. (NY) have large spores as does the type of P. cubensis; these species are considered to be synonyms of P. cubensis following Singer & Smith (1958).

It is interesting to observe that while the group of fungi with the large spores grows in subtropical or northern localities, the group of fungi with the smaller spores grows in the tropics of subtropics near the equator, an observation that agrees with that discussed by the author (Guzmán, 1977-A; 1978) in regards to other species of Psilocybe (P. uspanapensis Guzmán, P. singeri Guzmán, P. weldeni Guzmán, and others), which only grow in the tropical rain forest and have very small spores in comparation with P. aztecorum Heim, P. baeocystis Sing. & Smith, P. cyanescens Wakef. wich have large spores and grow only in high mountains of Mexico (the first) and in the NW of U.S.A. (the others).

Material studied. BRAZIL, Rio Grande do Sul, Itacolomi, Gravatai, March 2, 1971, Guzmán 8828 (ENCB); Santa Maria, 1935, Rick 9376 (FH, PACA 15227 Type of Stropharia subcyanescens Rick)*. ARGENTINA, Buenos Aires Region, Punta Lara, Sept. 21, 1960, Singer S-192 (BAFC)**.

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* Material first studied by Singer (1953), who considered Rick's specimens as neotype of S. subcyanescens and synonymous with Psilocybe cubensis.

** Reported by Singer (1960).

### Psilocybe dumontii Sing. ex Guzmán, sp. nov.

A Psilocybi yungensi affini differt cheilocystidiis, 11-18 (-26) x 3.3-6 (-7.7) µm, hyalinis vel subbrunneis. Lignicola, Cerro Punta, Chiriqui, Panama, Dumont PA-2074 (NY) typus.

Pileus 8-15 mm diam., conical, papillate, smooth, but striate toward the margin, hygrophanous, brown to yellowish brown, subviscid or lubricous to dry. Lamellae adnate, very thin, dark violaceous brown. Stipe 25-35 x 1-1.5 mm, cylindrical, somewhat bulbous, hollow, whitish to reddish brown, densely covered by floccose, white fibrils of velar origin. Veil inconspicuous in the adult carpophores. Context whitish, staining blue to dark-blue when injured. Odor and taste not registred.

Spores (4.4-) 4.9-5.5 (-6) x 4.4-4.9 x 3.3-4 µm, rhomboid in frontal view, subelliptic in lateral view, light brownish chocolate, thick walled and with a broad germ pore. Basidia 11-17 x 4.4-6 µm, two- or four-spored, hyaline, cylindrical-ventricose. Pleurocystidia none. Cheilocystidia 10-18 (-26) x 3.3-6 (-7.7) µm, abundant, forming a sterile band at the edge of the gill, polymorphous, fusoid, ventricose-rostrate, clavate, strangulate or mucronate, hyaline or some brownish. Subhymenium with parallel hyphae, strongly and irregularlly pigmented with chocolate brown pigment, 4-25 µm diam; in some parts, a lot of blue pigment can be seen diffused in the KOH between the hyphae. Trama regular, hyaline or pigmented as the subhymenium, hyphae, 5-20 µm diam, thick walled (1-3.3 µm thick), some are solid. Epicutis subgelatinized, formed by brown reddish to hyaline hyphae, parallel to the surface. Hypodermium as the subhymenium and trama hyphae.

Habitat. On rotten wood in subtropical forest at 1800 m elevation. Known only from the type locality.

Studied material. PANAMA, Prov. Chiriqui, Cerro Punta, near Nueva Suiza, July 3, 1975, Dumont PA-2074 (Holotype NY; Isotype at ENCB).

Discussion. This species is close to P. yungensis Sing. & Smith, but differs in the smaller and brownish cheilocystidia. The brownish cheilocystidia connects P. dumontii with those species described by Guzmán (1977-A) from the tropical rain forests of Mexico such as P. singeri Guzmán, P. weldenii Guzmán and others. The species is named after Dr. K. Dumont, collector of the type material, in recognition of his enthusiastic mycological work in South America.

## Psilocybe farinacea Rick ex Guzmán, sp. nov.

Pileo 20-40 (-80) mm lato, convexo vel subcampanulato, spadico vel alutaceous. Lamellis adnatis, ochraceo-violaceis. Stipite 35-65 (-80) x 3-8 mm, albido, caerulescente. Velo arachnoideo albido vel violaceo. Annulo nullo. Carne caerulescente, odore et sapore farinaceis. Sporis 7.5-9 (-10.5) x 5.2-7.5 x 3-4 µm, subrhomboideis. Pleurocystidiis nullis. Cheilocystidiis 22-33 x 5-7.5 µm, hyalinis. Epicute subgelatinascente. At terram, Sao Leopoldo, Rick (Lloyd Herbarium 27598) typus.

Pileus 20-40 (-80) mm diam., convex to subcampanulate, smooth but slightly striate at the margin, subviscid to dry, brownish to brownish reddish or straw color. Lamellae adnate or sinuate, brownish violaceous or brownish chocolate, with whitish edges or concolorous. Stipe 35-65 (-80) x 3-8 cm, cylindrical, uniform or subbulbous, hollow, whitish to brownish, smooth or with floccose fibrils at the apex, veil remnants, staining blue when injured. Veil arachnoid, white to violaceous, but not forming an annulus on the stipe. Context whitish, staining blue when cut. Odor and taste farinaceous.

Spores 7.5-9 (-10.5) x 5.2-7.5 x 3-4 µm subrhomboid in face view, elliptic in side view, thick walled brownish yellowish and with a broad basal germ pore. Basidia 10-15 x 7-8 µm, two or four-spored, vesiculose, hyaline. Pleurocystidia none. Cheilocystidia 22-33 x 5-7.5 µm, vesiculose-fusiform with more or less long necks 2-3 µm diam., hyaline, forming a sterile band along the edge of the gill. Subhymenium and trama brownish, with collapsed hyphae. Epicutis subgelatinized formed by parallel hyaline hyphae. Hypodermium brownish with elongated hyphae, 8-10 um diam. Clamp connections scarce.

Habitat. Gregarious on soil. Known only from the type locality.

Studied material. BRAZIL, Sao Leopoldo, May 1908, Rick (Holotype, Lloyd Herb. 27598; BPI).

Discussion. P. farinacea is very close to P. caerulescens Murr., but differs in the size of the spores and cheilocystidia. This species was named by Rick and sent to Lloyd but, apparently, was never described. Its bluing indicates that this species probably is hallucinogenic.

## Psilocybe fimicola Guzmán, sp. nov.

A Psilocybe coprophila affini differt sporis (6.6-) 7.7-8.8 (-11) x 4.4-5 (-6) x 3.8-5 µm ellipticis, pleurocystidiis et cheilocystidiis hyalinis vel lutescentibus, 33-60 x 11-15.4 µm, mucronatis. Ad fimum, Cundinamarca, Pá-

*ramo de Palacio, Colombia, Guzmán 9096 (COL), typus*.

Pileus about 10 mm diam., convex, smooth, with some white floccose traces of the silky evanescent veil, slightly striate by transparency when moist, lubricous, hygrophanous, brown to reddish yellow, fading to ochraceous or straw color. Lamellae broad adnate, brownish to brownish violaceous. Stipe sbout 25 x 1 mm, cylindrical, hollow, whitish to reddish brownish, covered with floccose, more or less white evanescent fibrils. Context whitish in the pileus, brownish in stipe, not staining blue; taste and odor none.

Spores (6.6-) 7.7-8.8 (-11) x 4.4-5 (-6) x 3.8-5 µm, elliptic both frontally and laterally, but sometimes slightly subrhomboid in face view, thin walled, with a broad germ pore. Basidia 25-30 x 6-7 µm, two of four spored , hyaline, vesiculose-pyriform. Pleurocystidia abundant, in size, shape and structure like the cheilocystidia, but many yellowish or brownish towards the base. Cheilocystidia 33-60 x 11-15.4 µm, abundant, hyaline, few are yellowish or brownish toward the base, fusiform or vesiculose, but mucronate; the mucro 4.4-5.5 µm long. Subhymenium with globose brownish yellowish elements. Trama regular, with brownish orange diffused pigment or hyaline. Epicutis subgelatinized, with hyaline thin hyphae. Clamp connections present.

Habitat. Gregarious on horse dung, in páramos at 3400 m elevation. Known only from the type locality.

Studied material. COLOMBIA, Department of Cundinamarca, Páramo de Palacio. Hacienda La Siberia, road La Calera to La Mina, July 23, 1971, Guzmán 9096 (Holotype COL; Isotype ENCB).

Discussion. *P. fimicola* has the fruit body and the habitat of *P. coprophila* but differs in the microscopic features. It is close to *P. horakii* Guzmán, but differs in the size of the cheilocystidia and spores. Since these species do not stain blue, probably they are not hallucinogenic. *P. fimicola* and *P. horakii* are close to *P. crobula* (Fr.) Lange ex Sing. for the structure of the spores.

### *Psilocybe furtadoana* Guzmán, sp. nov.

*A Psilocybi brasiliensi affini differt pleurocystidiis nullis, sporis (4.5-) 5.5-6.6 (-7) x (3.8-) 4.4-4.9 (-5.5) x 3.8-4.2 µm. Ad terram in silvis Araucariae et Podocarpi, prope Campos de Jardao, Estado de Sao Paulo Brasiliae, Guzmán 8918 (SP) typus*.

Pileus about 15 mm diam., subcampanulate to papillate, smooth, transparent-striate when moist, lubricous, hygrophanous, dark reddish brown to ochraceous or stramineo. Lamellae subadnate, dark violet brown with whitish edges. Stipe about 35 x 1 mm, cylindrical, uniform, hollow, reddish brown towards the base, covered with whitish floccose fibrils of the veil. Veil white and fugacious. Context whitish, fleshy in the pileus, brownish and fibrillose in the stipe; taste and odor farinaceous, slightly blue-staining when cut.

Spores (4.5-) 5.5-6.6 (-7) x (3.8-) 4.4-4.9 (-5.5) x 3.8-4.2 µm, subrhomboid frontally, subelliptic laterally, yellowish brown, smooth, thick walled, with a broad germ pore. Basidia 10-13.2 x 4.4-5.5 µm, four-spored, hyaline, subvesiculose. Pleurocystidia none. Cheilocystidia 11-18 x 4.4-6.6 µm, abundant, hyaline or chocolate brown toward the base, bottle shaped or sublageniform, some fusoid-ventricose. Subhymenium with elongate parallel hyphae, with reddish brown irregularly distributed pigment. Trama regular, colored like the subhymenium or hyaline, with hyphae up to 6 µm diam. Epicutis with subgelatinous reddish brown to hyaline hyphae, around 4 um diam. Hypodermium gradually hyaline, with hyphae thin walled, 5-12 µm diam. Clamp connections present.

Habitat. Solitary on soil in open forest of Araucaria brasiliana with Podocarpus. Known only from the type locality.

Studied material. BRAZIL , 5 km West of Campos de Jardao, State of Sao Paulo, March 8, 1971, Guzmán 8918 (Holotipe SP; Isotype ENCB).

Discussion. This species is close to P. brasiliensis but the absence of pleurocystidia, the structures of the subhymenium, as well as the size of the spores and cheilocystidia separate it clearly from the latter. This species is named in honor of Dr. J.S. Furtado who helped the author collected this and other fungi in Brazil.

## Psilocybe hoogshageni Heim

After studying a collection made by L. Berttucci on April 28, 1962 (BAFC) and identified by Singer as P. zapotecorum, the author of the present paper found it to represent P. hoogshageni. The material was collected in the Delta of the Rio Paraná, near Buenos Aires, in a subtropical forest on swampy soil. The author knew this locality from collecting fungi with Dr. J. Wright in Febrary of 1971, but unfortunately was unable to find this species again. It must be a very rare species there. He found only Oudemansiella canarii (Jungh.) Höhnel (topotype of O. platensis (Speg.) Speg.) a fungus of the deciduous or subtropical forests of Mexico, where P. hoogshageni grows. Berttucci's collection agrees well with the type of P. hoogshageni (in PC) in all the macroscopic and microscopic features (See Guzmán 1977-B).

## Psilocybe horakii Guzmán, sp. nov.

Pileo 8-21 mm lato, convexo vel conico campanulato dein subumbonato, hygrophano, brunneo vel alutaceo, sicco. Lamellis ampli adnatis vel subdecurrentibus, spadiciis subaurantiaeis. Stipite 30-35 x 1-2 mm dilute brunneo vel rufobrunneo, fibriloso vel subfloccoso. Odore grato. Sporis (5.5-) 6-7.1 (-7.7) x 3.8-4.4 x 3.3-3.8 µm, subellipsoideis. Pleurocistidiis 19.5-30 (-46) x 7.7-9.9 (-12) µm, hyalinae mucronatus. Cheilocystidiis aequalibus pleurocystidiis, abundantibus. Ad fimum; Lagunas de Yala, prope Jujuy, Argentina, Horak 66/454 (ZT), typus.

Pileus 8-21 mm diam., convex to conic-campanulate or subumbonate, smooth, hygrophanous, dark brown when moist, drying paler, not viscid. Lamellae broadly adnate to subdecurrent, argillaceous or orange brownish, edge concolorous. Stipe 30-35 x 1-2 mm, cylindrical or attenuated towards apex, hollow, pale brown to reddish brown, some fibrillose or floccose with fibrils, base with white tomentum. Context whitish or brownish, not blue-staining; odor pleasant (sweetish), taste not checked; spore print dark brown.

Spores (5.5-) 6-7.1 (-7.7)x3.8-4.4 x 3.3-3.8 µm, yellowish brown, subelliptic in lateral, somewhat subrhomboid in face view, thin walled, with a narrow germ pore. Basidia 16-22 x 4.4-5.5 µm, four-spored, hyaline, vesiculose. Pleurocystidia 19.5-30 (-46) x 7.7-9.9 (-12) µm, hyaline, very numerous toward the edge of the gill, vesiculose and mucronate or fusoid-cylindric and mucronate, apical mucro 1.6-5.5 x 1.4-3 µm. Cheilocystidia like the pleurocystidia, abundant, easily visible under the microscope. Subhymenium formed by globose hyaline elements, irregularly pigmented with brownish orange incrusting pigment. Trama regular, brownish with parallel hyphae, less incrusted by pigment. Epicutis subgelatinized, formed by parallel, hyaline to brownish hyphae. Hypodermium hyaline formed by elongated hyphae. Clamp connections present.

Habitat. Subgregarious on dung. Known only from the type locality.

Material Studied. ARGENTINA, near Jujuy, Lagunas de Yala, March 1, 1962, Horak 66-454 (Holotype ZT; Isotype BAFC).

Discussion. P. horakii is close to P. fimicola Guzmán (see discussion of this). The species is named after Dr. E. Horak who collected the type and kindly sent it to the author.

## *Psilocybe merdaria* (Fr.) Ricken

This fungus had been reported from Argentina by Spegassini, 1899 and Horak, 1967; from Brazil by Spegazzini, 1919; Rick, 1961 and from Uruguay by Herter, 1933 in doubtful reports, because of the various taxonomic interpretations of *P. merdaria* according to different authors. *P. merdaria* as it is understood by this writer, has spores (9.3-) 9.9-11 (-12.6) µm long., grows or dung or on rich soil and has an annulus. Those specimens with large spores (11-) 12-14 (-16.5) µm long) following Møller (1945) and Singer (1969) belong to another variety that is here described as an independent species (see below).

The fungus reported from Argentina by Spegazzini (1899) as *Stropharia merdaria* (LPS 16833) really is *P. merdaria* because of its smaller spores, but the fungus reported by Horak (1967) as *P. merdaria* belongs to the new species with bigger spores, *P. moelleri* (see below).

The studied material by the author from Venezuela (Guzmán 9171, N. of Merida, San Javier, July 27, 1971, on cow dung, ENCB) agrees well with *P. merdaria*. Its spores are subrhomboid or subhexagonal in face view, thick walled, (9.3-) 9.9-11 (-12.6) x 6.6-7.7 (-8.8) x 6-7.1 µm. Pleurocystidia are absent. Cheilocystidia are 22-27 x 6.6-7.7 µm, fusoid-ventricose with narrow neck and obtuse to capitate tips. The pileus is about 9 mm broad, convex, smooth, dry, brownish to straw-colored. Lamellae broad adnate, grayish violet. Stipe whitish to yellowish, with a membranous white annulus. This seems to be the first report of *P. merdaria* from Venezuela.

## *Psilocybe moelleri* Guzmán, sp. nov.

= *Stropharia merdaria* f. *macrospora* Möller,
Fungi Faeröes 1: 195, 1945.
= *Psilocybe merdaria* var. *macrospora* (Möller)
Sing., Nova Hedw. 29: 243, 1969

*A Psilocybe merdaria affini differt sporiis (11-) 12-14.3 (-16.5) x 7.7-8.8 x 6.6-7.7 µm. Ad fimun vel prope fimum. Dune city, Lane Oregon, U.S.A. Guzmán 16664 (ENCB), Typus.*

A complete description of this species is in Singer (*op. cit.*). *P. moelleri* differs from *P. merdaria* only in the size of the spores, as *P. coprophila* and *P. argentina*.

*P. moelleri* is a very common fungus in North America, South America and Europe, as Singer (1969) has pointed out. He reported as *P. merdaria* var. *macrospora* Sing. from Argentina and Chile. The author studied material from PERU: Dumont PE-1354, Dept. Junín, road Huancayo to Satipo, July 9, 1976 (NY) and it seems to be the first record of the species from that country.

### Psilocybe montana (Pers. ex Fr.) Kumm.

A very common species growing on mosses (principally Polytrichum) in temperate regions. Singer (1969) reported it from Chile, and in the present paper it is reported from Colombia and Venezuela.

Material studied: COLOMBIA, Cundinamarca Dept., Páramo de Palacio, Hacienda La Siberia, July 23, 1971, Guzmán 9128 (COL; ENCB); Aug. 26, 1964. Betancourt 165-A (COL; ENCB). Road to Pacho, near Upapira, Aug. 19, 1964, Guzmán 4550 (COL, ENCB). VENEZUELA, Parque Nacional Sierra Nevada, Teleférico de Mérida, La Aguada Station, July 20, 1971, Guzmán 9240; 9286 (ENCB). Sierra Nevada de Santo Domingo, Laguna de Mucubaji, July 28, 1971, Guzmán 9235; 9238 (ENCB, MER).

The description from Chile of this species given by Singer (1969) agrees well with the concept of the author of the present paper and with those materials from Mexico (Guzmán et al. 1977) and from Europe studied by him. An important feature not mentioned by Singer (1969) is the conspicuous yellow brown pigment incrusted on the walls of the hyphae of the subhymenium, which can be mistaken for irregular or collapsed chrysocystidia. The Colombian and Venezuelan material was collected in the páramos with Espeletia, at 3000-3600 m elevation.

### Psilocybe panaeoliformis Murr.

This species was know only from Mississippi and Alabama, U.S.A. (Murrill, 1923; Smith, 1948). It is closely related to P. coprophila (Bull. ex Fr.) Kumm. but differs in the small spores ((8.5-) 9.9-11 (-11.5) x 6-7.1 x 5.5-6 µm in P. panaeoliformis, against (9-) 10-12 (-14) x (6-) 7-9 x 6-7.1 µm in P. coprophila). Both are fimicolous (cow or horse dung) species. P. panaeoliformis reported by Kitamoto et al. (1975) from Japan really is P. coprophila. This observation is based on study by the author of the collections considered by Kitamoto et al. and deposited in MICH.

P. panaeoliformis is reported for first time from Ecuador, based on two collections made by Dumont and deposited in NY: Dumont EC-1920, and EC-1921, 22 km from Zamora, road to Loja, Aug. 1, 1975, at 1700 m elevation, gregarious on horse dung.

Dumont's collections were compared with the type (NY) and agree well, except for the presence of a more or less developed annulus. They may therefore belong to a new variety, but for the moment it appears preferable to refrain from describing a variety because of the lack of sufficient information on the fresh condition. It is possible that we have a case here similar to the one discussed under *P. andina* Guzmán

### *Psilocybe pintonii* Guzmán, sp. nov.

*Pileo 15-40 mm lato, subconvexo vel subumbonato vel subpapillato, demum frequenter applanato glabro, hygrophano, brunneolo. Lamellis sinuatis vel adnatis, brunneolis. Stipite 25-60 x 3-5 mm. Subalbo deim pileo subconcolori, floccoso versus basim. Carne caerulescente, odore farinaceo. Sporis (6-) 6.6-7.7 (-8.8) x (3.3-) 4-4.5 µm, ellipsoideis. Pleurocystidiis nullis. Cheilocystidiis 17-20 x 4-7 µm, hyalinis. Epicute subgelatinascente, hyalinae. Ad terram vegetatione herbaceae distitutam, in paramo Espeletiae. Páramo de Palacio, Hacienda La Siberia, Cundinamarca Dept., Colombia, Guzmán 9762 (COL) typus.*

Pileus 15-40 mm diam., subconvex to subumbonate or subpapillate, sometimes irregularly lobulate, eventually applanate or subconcave, smooth, but when young covered by white fibrils from the veil; sometimes slightly rimose, lubricous to dry, slightly transparently striate when moist, hygrophanous, brownish to orange brown or chocolate brown, fading to a dirty yellow. Lamellae sinuate or adnate, brownish to gray violet, thick with whitish to concolorous edges. Stipe 25-60 x 3-5 mm, cylindrical, hollow, whitish to subconcolorous with the pileus, covered toward the base by floccose white veil fibrils; base remaining somewhat blackish in dried specimens. Both pileus and stipe stain green-blue when injured. Veil well developmed when young but absent in the adult stage. Context whitish to brownish, fleshy in the pileus, fibrous-hard in stipe; staining blue when cut, with farinaceous odor and taste.

Spores (6-) 6.6-7.7 (-8.8) x (3.3-) 4-4.5 µm, ellipsoid or subelliptic, somewhat subrhomboid in face view, thin walled, smooth, brownish yellow. Basidia 16-22 x 4.4-8 µm, four-spored, cylindric-pyriform, sometimes sinuos-pyriform. Pleurocystidia none. Cheilocystidia 17-20 x 4-7 µm, hyaline, ventricose-fusoid, lageniform, irregularly ventricose with constrictions or branched or with capitate to subcapitate apex, mixed with basidia in different stages of deformation. Subhymenium brownish without incrusting pigment, but with thick irregular walls in the hyphae; these 6-25 µm broad. Epicutis subgelatinized, formed by hyaline elongated and parallel hyphae 3-5 µm broad. Hypodermium with hyphae with reddish brownish 4-8 µm broad.

Habitat. Solitary or gregarious on soil without herbaceous vegetation, in páramos with *Espeletia*, at 3450-3600 m elevation.

Studied material. COLOMBIA, Cundinamarca Dept., Páramo de Palacio, Hacienda La Siberia, road La Calera to La Mina, near the branch to Rincón del Oso, Aug. 20, 1964, Guzmán

9160 (ENCB); July 23, 1971, Guzmán 9762 (Holotype COL; Isotype ENCB).

Discussion. This species is close to P. zapotecorum Heim and P. muliercula Sing. & Smith, and certainly belongs to the same group, but the special cheilocystidia separate it well from the other species. Because of the bluing reaction and the farinaceous odor and taste, this is probably a hallucinogenic species, but there is no information about its use. The same situation holds true for P. columbiana.

### Psilocybe subcubensis Guzmán, sp. nov.

A Psilocybe cubensis affini differt sporis, (9.9-) 11-13 (-14) x 7.7-8.8 x 6.6-7.1 µm. Ad fimum in regionibus tropicis vel subtropicis. Contla, NE de Tamazula, Jalisco, Mexico, Galindo (ENCB), typus.

All macroscopic and microscopic characters of this species seem to agree well with those of P. cubensis, except for size of the spores. These are (9.9-) 11-13 (-14) x 7.7-8.8 x 6.6-7.1 µm (see discussion under P. cubensis). The pileus is yellow on the margin to brownish-reddish near the umbo, fading all over to whitish. The lamellae are adnate or adnexed, grayish violet to dark violaceous. Stipe whitish, with a well developed white annulus, which becomes stained by spore deposits. Spore print dark brownish violet. Pleurocystidia 16-22 x 10-12 µm, hyaline, not numerous. Cheilocystidia 17-33 x 6.6-9 µm, with necks 2.2-5.5 µm diam., hyaline forming a sterile band at the edge of the gill.

Habitat. Gregarious on cow dung, in tropical regions, rared in subtropical regions. A pantropical and subtropical species.

Material studied. MEXICO, Jalisco, NE of Tamazula, Contla, Aug. 11, 1974, Galindo (Holotipe ENCB), and several collections from other States of Mexico, e.g. Huautla de Jiménez. HONDURAS, La Mosquitia region, Ahuas, Febr. 10, 1956, Guzmán 328-A (ENCB); Guampusirpe, March 1, 1956, Guzmás 374 (ENCB). COLOMBIA, Santander Dept., Puerto Wilches, between Gómez and km 80 of the railroad to the Atlantic, April 20, 1960, Romero 8361 (COL). Boyacá Dept., Choconta to Aguaclara, June 11, 1976, Dumont CO-4775 (NY), Dumont CO-4855-A. ECUADOR, road to Mendez, near Limón, Aug. 3, 1975, Dumont, EC-2060 (NY). BOLIVIA, Beni Dept., Prov. Vaca Diez, Guayaramerín, March 16, 1959, Singer B-2036 (BAFC; MICH). VENEZUELA, N of Mérida, San Javier del Valle, July 27, 1971, Guzmán 9165; 9182; 9183 (ENCB). AUSTRALIA, Queensland, Breban, March 25, 1974, Watling 10316 (E); near Laboutluse, April 1974, Watling 10778 (E).

Discussion. This is a hallucinogenic fungus often mistaken for P. cubensis. The smaller spores are the only characteristic feature separating this species from *P. cubensis*.

### *Psilocybe subyungensis* Guzmán, sp. nov.

*Pileo ad 10 mm lato, conico vel subpapillato, rufobrunneo vel alutaceo, hygrophano. Lamellis adnatis, violaceo-brunnis. Stipite usque ad 35 x 1 mm, concolori pileo, floccoso versus basis. Carne caerulescente. Sporis (4.4-) 5-6 (-7) x (4-) 4.4-5.5 (-6) x 3.3-4 µm, rhomboideis vel ellipsoideis. Pleurocystididiis 8.8-11 x 3.8-5.5 µm, hyalinis, sublageniniformibus. Cheilocystidiis 16.5-25 x (5.5-) 7.7-12 µm, hyalinis partim ramosis. Epicute subgelatinescente. Lignicola in sylvis, prope El Arco, Macaro, Miranda, Venezuela, Dumont VE-6363 (MER), Typus.*

Pileus about 10 mm diam., conic to subpapillate, smooth but somewhat striate at the margin, subviscid to dry, hygrophanous, reddish brown or brown, fading to yellowish, but staining blue to blakish when injured. Lamellae adnate, violaceous brown, edges concolorous or some whitish and floccose. Stipe about 35 x 1 mm, cylindrical, hollow, reddish brown to darker toward the base, appressed silky floccose from white fibrils, principally at the base. Veil ruddimentary and fugacious in the adult stage. Context brownish, bluing. Odor and taste unknown.

Spores (4.4-) 5-6 (-7) x (4-) 4.4-5.5 (-6) x 3.3-4 µm, rhomboid in face view, subelliptic in side view, brownish yellow, with thick wall and distinct broad germ pore, with a short basal appendage. Basidia 10-20 x 4.4-6 µm, four-spored, hyaline, vesiculose-cylindric, with a slight constriction in the middle. Pleutocystidia 8.8-11 x 3.8-5.5 µm, hyaline, scanty, sublageniform or fusoid-ventricose with short neck, 1-2 µm diam. Cheilocystidia 16.5-25 x (5.5-) 7.7-12 µm, hyaline, lageniform, fusoid-ventricose, subpyriform, clavate, ventricose with constrictions in the middle, ampullaceous to somewhat irregularly branched, often reminding one of basidia. Subhymenium brownish yellow with more or less parallel hyphae, strongly irregularly pigmented on the walls. Trama regular, subhyaline or yellowish, with parallel hyphae 7-12 µm broad, with pigment incrusted on the thick walls, with appear perforated. Epicutis subgelatinized, hyaline with elongated hyphae 3-5 µm broad. Hypodermium like the subhymenium and trama. Some parts of the epicutis and subhymenium with blue green diffused pigment in KOH. Clamp connections present.

Habitat. Gregarious on very rotten wood inside the forest. Known only from the type locality.

Studied material. VENEZUELA, State of Miranda, SW of Macaro, near El Arado, July 28, 1972. Dumont VE-6363 (Holotipe MER, Isotype, NY).

Discussion. P. subyungensis is close to P. yungensis, but the pleurocystidia and cheilocystidia separate the former from the latter. It is also close to P. fuliginosa (Murr.) Smith but according to a study of the type (NY) and Smith's paper (1948), has larger spores, (5.5-) 6-7 (-8) µm long., the cheilocystidia are more uniformly lageniform 16-28 (-33) x 4.4-6.6 µm.

Psilocybe tortipes Speg., Ann. Mus. Nac.Buenos Aires 6:151, 1898. Synonymy of Naematoloma tortipes (Speg.) Guzmán, Mycotaxon 6: 476, 1978.

The author recently transfered this taxon to Naematoloma (Guzmán & Vergeer, 1978) after study of the type (LPS 16820), which has spores 12-18 (-19) x (6-) 9.7-15 µm and chrysocystidia 20-45 x 5-15 µm. Psilocybe tortipes sensu Rick after study the material: Rick 179 (PACA 14560) (and in FH, PC, BPI and NY) is another species of Naematoloma, because has spores 10.5-13 (-15) x 6-7.5 µm (Rick, 1961, reported spore size 12-14 x 9-10 µm, as did Spegazzini in the original description) (!). Singer (1951) considered P. tortipes sensu Rick as Naematoloma subumbonatescens (Murr.) Sing. (a synonym of N. ericaceus Pers. ex Fr.) Smith). Spegazzini himself was apparently not too familiar with P. tortipes, since another collection (LPS 16821) of P. tortipes is a Panaeolus sp.

Psilocybe uruguayensis Singer ex Guzmán, sp. nov.

Pileo 10-30 mm lato, convexo, laevi, rubro-brunneo vel alutaceo, non caerulescente. Lamellis adnatis, brunneo-violaceis. Stipite 40-55 x 2-3 mm albido vel concolori pileo, haud caerulescente, annulatus. Sporis (7.5-) 8.8-11.3 (-12.7) x 7-8 (-9) x 6-7 µm, ovoideis vel subrhomboideis vel inaequilateralibus. Pleurocystidiis nullis. Cheilocystidiis 24.5-32 x 4.5-9 µm, hyalinis,longicollis, collo 1.5-2 µm lato, interdum ramoso. Subhymenio et tramate subbrunneis vel hyalinis. Hyphis fibulatis. Ad fimum, Uruguay, García Zorrón 2439 (BAFC) typus.

Pileus 10-30 mm diam., convex, smooth subviscid, brownish to brownish yellow, not staining green or blue in any part. Lamellae adnate to somewhat sinuate, brownish to violaceous-brown, unicolorous. Stipe 40-55 x 2-3 mm, cylindric, not bulbous, smooth, whitish above to brownish or concolorous with pileus below. Annulus membranous, whitish, not staining blue. Context whitish, not bluing. Odor and taste unknown.

Spores (7.5-) 8.8-11.3 (-12.7) x 7-8 (-9) x 6-7 µm, ovoid or subrhomboid in face view, inequilateral, smooth, with thick yellowish brown wall, with truncated apex because of a flattened germ pore. Basidia 25-30 x 7.5-9.5 µm, including sterigmata which are 4-6 µm long, four-spored, hyaline, subcylindric or vesiculose. Pleurocystidia none. Cheilocystidia 24.5-32 x 4.5-9 µm, hyaline, abundant, forming a sterile band at the edge of the gills, ventricose-elongated, somewhat pedicellate, but with a narrow and long neck which is 1.5-2 µm broad, sometimes branched in old specimens. Subhymenium pale yellowish brown, without incrusted pigment. Trama regular, same color as the subhymenium or hyaline, with inflated hyphae up to 35 µm broad. Epicutis with a thick layer of gelatinous hyphae, parallel to the surface. Clamp connections present.

Habitat and distribution. Gregarious on horse dung, only known from the type locality.

Studied material. URUGUAY, Montevideo, Parque Nacional Carrasco, April 3, 1960, García Zorrón 2439 (Holotype BAFC: Isotypes in MICH and ENCB).

Discussion. The name *P. uruguayensis* was given to a collection in BAFC by Singer but remained unpublished. Singer thinks that this species stains blue when fresh. It is close to *P. blattariopsis* (Speg.) Sing. but this species has brown pleurocystidia according to a study of the type (Spegazzini 1535, LPS). It is also close to *P. subaeruginascens* Höhnel, *P. stuntzii* Guzmán & Ott and *P. venenata* (Imai) Imaz. & Hongo, but differs in the size of the cheilocystidia and spores; it is interesting to see the geographical distribution of these species; *P. subaeruginascens* in only known from Java, *P. venenata* from Japan and *P. stuntzii* from the NW of North America. (See discussion of *P. blattariopsis*).

## *Psilocybe wrightii* Guzmán

*Pileo 25-65 mm lato, subconvexo vel subumbonato, margine substriato, levi, viscido, hygrophano, brunneo vel rufobrunneo vel alutaceo. Lamellis subadnatis vel sinnuatis, alutaceo violaceois vel brunneo-violaceis. Stipite 80-95 x 5-9 mm, carneo albido deim brunneolo, ad basim floccoso, caerulescente. Carne caerulescente, odore et sapore farinacis. Sporis (6-) 6.6-7.7 (-8.5) x 5.5-6.6 (-7.1) x 3.5-5.5 µm, subrhomboideis vel subellipsoideis. Pleurocystidiis 15-22 x 5.5-6.6 µm, hyalinis, sursum 3.3-4 um latis. Cheilocystidiis 13-22 x 4.5-6 µm, hyalinis, brevibus collo 2-2.5 um diam. Epicute gelatinascente. Ad terram, gramminicola, prope Estación de Aforos, road Tucumán to Tafi del Valle, Argentina, Guzmán 8683 (BAFC) typus.*

Pileus 25-65 mm diam., subconvex to subumbonate, smooth to substriate at the margin, some rimose in old specimens, viscid to subviscid, hygrophanous, brown or reddish brown to brownish yellow, some straw-colored. Lamellae subadnate or sinuate, yellowish violaceous to brownish violaceous or chocolate brown, somewhat mottled; edges whitish to concolorous. Stipe 80-95 x 5-9 mm, cylindrical, equal or slightly subbulbous, hollow, whitish to yellowish, finally brown reddish to blackish; staining blue when touched or injured; covered by floccose white fibrils toward the base. Context white and fleshy in the pileus, yellowish and subgelatinous to subcartilaginous in the stipe; staining blue when cut. Odor and taste farinaceous. Spore print dark violaceous-brown.

Spores (6-) 6.6-7.7 (-8.5) x 5.5-6.6 (-7.1) x 3.5-5.5 µm, subrhomboid, some obscurely angular in face view, but broadly elliptic or subelliptic in side view, smooth, yellowish brown thick walled, with broad flattened germ pore. Basidia 20-30 x 6-8 µm, four spored, vesiculose-pyriform, with a slight constriction in the middle. Pleurocystidia 15-22 x 5.5-6.6 µm, hyaline, not abundant, vesiculose-fusoid, attenuate above and with a rounded nucro or sublageniform, neck 3.3-4 um across. Cheilocystidia 13-22 x 4.5-6 µm hyaline, ventricose-rostrate, with necks 2-2.5 µm, forming a sterile band along the gill edge. Subhymenium yellowish with irregular brownish yellow pigment incrustations. Trama hyaline to yellowish, parallel, colored by brownish yellow pigmented irregularly incrusted hyphae which often resemble collapsed chrysocystidia. Epicutis formed by subgelatinized parallel hyphae, which are elongated to subglobose, hyaline to brownish. Hypodermium yellowish or hyalie, with some latiferous hyphae, hyaline or brownish, 5-7 µm broad. Clamp connections present.

Habitat. Gregarious on grassy soil outside of the subtropical forest at 900 m elevation.

Studied material. ARGENTINA, road Tucumán to Tafí del Valle, 3 km W of Station Aforos, Febr. 18, 1971, Guzmán 8683 (Holotype BAFC; Isotype ENCB).

Discussion. P. wrightii is close to P. caerulescens Murr. but the pleurocystidia and the pigmented trama separate it from the latter as well as the thin floccose stipe. The report of P. caerulescens by Singer and Digilio (1951) from the Rio de los Sosas, which is close to Aforo Station, it is possible a record of P. wrightii (no material of that species was available to the author in LIL and in BAFC). The species here described, is certainly hallucinogenic because of its bluing, and its taste and flavor. It is named after Dr. J.E. Wright, who helped the author during his collecting trip to Argentina in 1971.

## Psilocybe yungensis Singer & Smith

This species was described (Singer & Smith, 1958) from Bolivia and more late (Heim & Wasson, 1958) reported from Mexico; both localities in deciduous forests at 1500-2000 m alt. The study of the type (Singer B-648, MICH) as well as many collections from Mexico (in ENCB) let to the author to know the variation on the form of the pileus and to establish that P. yungensis var. diconica Sing. & Smith described from the same locality of the type variety (Singer & Smith, 1958) is a synonym of that. The obconic or conic papilla on the pileus is the only feature used by Singer and Smith to separate both taxa, but as it is possible to find intermediate specimens in the same population, the author did not think sufficiently distinct to separate both forms. Even, studying the plates of P. yungensis in Heim & Wasson (1958) and in Heim et al. (1967) it is possible to see the variation of the pileus, from conic to papillate in different forms, both in wild or culture specimens. This variation of the pileus is also possible to observe in P. hoogshageni Heim, P. zapotecorum Heim emend. Guzmán and in P. fagicola Heim (this latter only known from Mexico). The spores of P. yungensis are (4.4-) 5-6 (-7) x (3.8-) 4.4-5 (-6.2) x 3.3-4 µm.

## Psilocybe zapotecorum Heim
emend. Guzmán, Nova Hedwigia, 1977

Until now this species was known only from Mexico (Heim and Wasson, 1958) growing on muddy soil in the subtropical forest. Recently (Guzmán, 1977-B) made an emendation and included P. candidipes Sing. & Smith and P. bolivarii Guzmán as synonyms. P. zapotecorum is indeed very variable in the form and the colors of the fruiting body, but the microscopic characteristics are constant. The South American material here studied agrees well with the type and with other Mexican specimens. They have spores (5-) 6-7 (-7.5) x (3.3-) 3.5-3.8 (-4.2) um, elliptic, brownish pallid thin walled. Pleurocystidia 21-30 x 9.9-14 um, hyaline or occasionally brownish, globose-piriform. Cheilocystidia 13-25 x 3.5-6 um, hyaline, fusoid-ventricose or lanceolate pyriform, some with long necks, singly or rarely branched. All carphores are strongly bluing, even in the hymenium and subhymenium (in KOH). P. zapotecorum is close to P. aggericola Sing. & Smith as was discussed in this paper. The material studied so far represents new records of this species.

Studied material. PERU, Dept. of Huanuco, road to Pucalpa, 38 km from Tingo Maria, July 4, 1976, 1600 m elevation, Dumont PE-756 (NY); PE-809 (NY). BRAZIL, Parque do Estado Sao Paulo, June 13, 1961, Furtado (SP, 62044; ENCB).

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# STUDIES IN THE GENUS CORTINARIUS, IV: SECTION DERMOCYBE, NEW NORTH AMERICAN SPECIES[1]

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## SUMMARY

Two new species of *Cortinarius*, *C. cascadensis* and *C. idahoensis*, are described from western North America. Both are in the section *Dermocybe*.

## INTRODUCTION

In our investigations of *Dermocybe* in North America we have designated several new taxa (1-4). Certain species, such as *C. incognitus* Ammirati and Smith, seem to be widespread and fairly common, while others, for example *C. humboldtensis* Ammirati and Smith, appear to be relatively rare. Based on collecting done by the authors in the western mountains and coastal regions of North America it appears that both *C. cascadensis* and *C. idahoensis* are rare. These taxa were first recognized as distinct in the early 1970's and since then we have gathered no further information on them. With the publication of their descriptions here it is hoped that workers in western North America will search for these species in their mushroom flora.

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[1] Portion of a dissertation submitted by the senior author to the Graduate School of The University of Michigan in partial fulfillment of the requirements for the degree of Doctor of Philosophy.

Microscopic studies were made from freehand sections mounted in KOH (2.5% aqueous solution) and Melzer's reagent. Macroscopic color reactions were made with 2.5% KOH. Specific color designations capitalized and enclosed in parentheses are from R. Ridgway, *Color Standards and Color Nomenclature (5).* Uncapitalized color terms are regarded as useful approximations. Collections cited in 'Collections examined' are deposited in The University of Michigan Herbarium (MICH).

## CORTINARIUS CASCADENSIS Ammirati and Smith, Sp. Nov.

Fig. 1

*Pileus 10-35 mm latus, convexus demum plano-convexus vel planus vel umbonatus, siccus, appresso-fibrillosus, margine olivaceo-fulvus, disco rufo-brunneus; contextus subolivaceo-flavus; odor et sapor nulli; superficies pilei et lamellae rufescentes in solutione kalii hydroxidi. Lamellae confertae demum subdissitae, initio sordide olivaceo-flavae deinde ferrugineo-brunneae, numquam aurantiacae. Stipes 20-55 mm longus, 2-8 mm crassus, aequalis vel subclavatus, bubalino-flavus, fibrillis bubalino-flavis vel subochraceis obtectus. Sporae 6-7.5 (-8) x (3.5) 4-4.5 µm, ellipticae, verruculosae. Holotypus: J.F. Ammirati 6156 (MICH), prope Lincoln Co., Oregon, November 11, 1971.*

PILEUS 10-35 mm broad, at first obtusely convex, expanding to plano-convex or plane, umbonate to subumbonate, with the margin incurved to decurved, opaque, moist to dry, appressed fibrillose, margin at first olivaceous (Old Gold) with faint olive-yellow (Aniline Yellow) tones along the edge and sometimes streaked reddish brown to dull brown, becoming more ochraceous to light fulvous (Ochraceous-Tawny) or reddish brown (Tawny) and in age sometimes shaded or streaked deep reddish brown (Warm Sepia or blackish Warm Sepia), disc at first more or less reddish brown (Tawny) becoming deeper reddish brown (Warm Sepia to Seal Brown). Context in younger basidiocarps watery olive or dull light yellow faded, in age more olive or shaded with reddish brown tones; odor not distinctive, taste not distinctive or raphanoid.

LAMELLAE close becoming subdistant, adnexed to uncinate, more or less ventricose mature, edges serrate, at first dull olive-yellow (Aniline Yellow) to brownish olive-yellow with olive-yellow edges, slowly more brownish to rusty brown and when real old rusty reddish brown or deep rusty brown, never passing through a distinct orange stage.

STIPE 20-55 mm long, apex 2-8 mm thick, equal or the base slightly enlarged, terete, apex silky and at first light dull yellow (Mustard Yellow) to buffy yellow (Buff-Yellow) or more ochraceous, from near the apex to the base covered by a more or less continuous sheath of buffy yellow (Buff-Yellow) to light ochraceous appressed fibrils, overall soon becoming watery orange-ochraceous to dull orange or orange-tawny, lower portion finally watery reddish brown (± Tawny) or darker reddish brown (Russet to Chestnut), in age the color may become sordid. Context stuffed, becoming hollowed, cortex dull ochraceous-orange and darkening as the surface, pith pale ochraceous buff to pale ochraceous or slightly orange-ochraceous.

PILEUS SURFACE AND LAMELLAE of fresh basidiocarps reddish with KOH.

SPORES 6-7.5 (-8) x (3.5-) 4-4.5 μm, in profile elliptic and obscurely- to somewhat inequilateral, in face view ovate to somewhat elliptic, verruculose, in KOH pale to light brown or pale yellow-brown, in Melzer's light yellow-brown to light yellowish orange-brown. BASIDIA 4-spored, 22-31 x 5-8 (-9) μm, clavate to somewhat ventricose, thin-walled, in KOH hyaline or less commonly containing concentrated yellow pigment or some more or less filled with yellow particles, in Melzer's pale yellow or more or less filled with yellow to yellow-orange particles. PLEUROCYSTIDIA absent. CHEILOCYSTIDIA not well differentiated, 10-16 x 5-8 μm, clavate to narrowly clavate, thin-walled, in KOH and Melzer's similar to basidia. SUBHYMENIAL HYPHAE compactly interwoven, cylindrical, 3-7 μm wide, thin-walled, in KOH and Melzer's as for hyphae of the lamellar trama. TRAMAL HYPHAE OF LAMELLAE subparallel to slightly interwoven, cylindrical to more or less inflated, 8-28 μm wide, thin-walled, in KOH hyaline to pale yellow, some containing concentrated yellow pigment or yellow particles, in Melzer's pale yellow. CUTICULAR HYPHAE OF PILEUS interwoven, more or less radially arranged, cylindrical to slightly inflated, 4-15 μm wide, thin-walled (up to 1.5 μm thick), in KOH hyaline to light yellow-brown or containing more or less concentrated brownish to vinaceous brown pigment, in Melzer's hyaline to brownish or yellowish brown; pileocystidia absent. TRAMAL HYPHAE OF PILEUS interwoven, more or less radially arranged, cylindrical to inflated, 8-30 µm wide, thin-walled, in KOH hyaline, pale yellow or pale yellow-green, some containing yellow to orange particles, in Melzer's pale yellow, some containing yellowish particles. CORTICAL HYPHAE OF STIPE longitudinally arranged, subparallel to more or less interwoven, cylindrical to more or less inflated, 8-25 µm wide, thin-walled, in KOH hyaline to pale yellowish, some filled with concentrated yellow pigment or containing yellowish particles, in Melzer's pale yellow to yellowish brown; caulocystidia present near the stipe apex, 15-60 x 7-15 µm, clavate to narrowly clavate or cylindrical, sometimes with a rounded-mucronate apex, thin-walled, in KOH hyaline to pale yellow, in Melzer's pale yellowish. CORTICAL HYPHAE cylindrical, 3-7 µm wide, thin-walled, in KOH hyaline to pale yellow, some containing yellow particles, in Melzer's pale yellow. CLAMP CONNECTIONS of the normal type, present throughout the basidiocarp. OLEIFEROUS HYPHAE present, in KOH yellowish to somewhat greenish or olivaceous. INTERHYPHAL PIGMENT DEPOSITS present in the pileus and lamellar trama and in the stipe cortex, in KOH yellow, yellowish green or olive-yellow, in Melzer's yellowish.

Gregarious on humus, rotten wood and on moss-covered base of hemlock trees, mixed conifer forest (hemlock, Douglas fir and spruce), November.

*C. cascadensis* is a very striking species characterized by an olive to fulvous or more reddish brown pileus, persistently dull olive-yellow lamellae and a dull yellow or buff-yellow to ochraceous stipe which soon becomes watery orange-ochraceous to dull orange throughout.

The olive-yellow lamellae distinguish it from species with orange lamellae, such as *C. zakii* Ammirati and Smith and *C. croceofolius* Peck. *C. humboldtensis* Ammirati and Smith is distinguished from *C. cascadensis* by its larger spores, the dark inky-violet KOH reaction of fresh pilei and the lack of strong orange colors in the stipe. *C. olivaceopictus* Ammirati and Smith has in common with *C. cascadensis* small spores and yellowish olive lamellae. The former, however, has a strongly olivaceous stipe with ferruginous to orange fibrils or fibrillose zones on the surface, a strongly olive-colored context and very small interhyphal pigment deposits.

*C. cascadensis* is named after Cascade Head Experimental Forest, Lincoln Co., Oregon.

Collection examined: OREGON: Lincoln Co.: J.F. Ammirati 6156 (holotype, MICH).

## CORTINARIUS IDAHOENSIS Ammirati and Smith, Sp. Nov.

Figs. 2 and 3

*Pileus 20-40 cm latus, obtusus vel convexus, deinde late convexus vel planus, fibrillosus, subhygrophanus, fuscus demum olivaceo-brunneus; contextus olivaceus demum ochraceus; odor indistinctus, sapor plusminusve amarus; superficies pilei rufo-brunnea in solutione kalii hydroxidi. Lamellae confertae, adnexae, ferrugineo-ochraceae vel aurantio-ochraceae. Stipes 40-70 mm longus, 5-10 mm crassus, aequalis, ferrugineo-ochraceus, fibrillis ochraceis obtectus. Sporae 7-9 x 4.5-5.5 µm, ellipsoideae, verruculosae. Hyphae cuticulae intertextae, pigmentia caeruleo-purpurea in solutione kalii hydroxidi praebentes. Holotypus: A.H. Smith 71073 (MICH), prope Bonner Co., Idaho, October 5, 1964.*

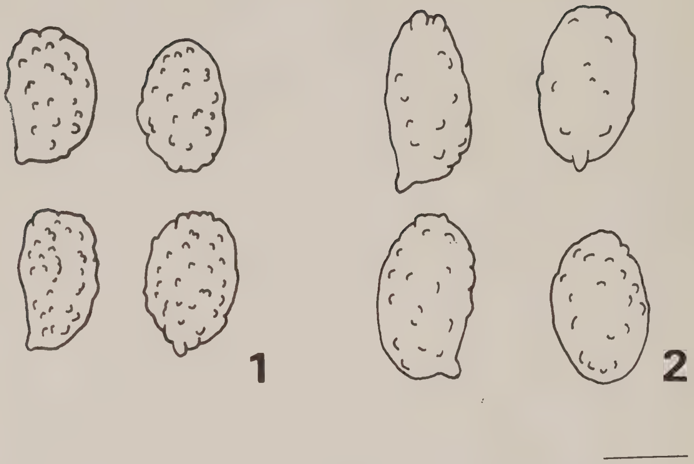
PILEUS (10-) 20-40 mm broad, obtuse to convex, becoming broadly convex to plane, with the margin incurved to decurved, fibrillose, moist and often fading (subhygrophanous), dark brown (a dark Bister) to dark cinnamon (Warm Sepia) moist, fading to olive-brown (Tawny-Olive), more or less opaque at all stages. Context olive when moist, ochraceous faded; odor indistinctive, taste more or less bitter.

LAMELLAE adnexed, close, broad, rusty ochraceous becoming ferruginous (near Sanford's Brown), then orange-ochraceous to orange-fulvous.

STIPE 40-70 mm long, 5-10 mm thick, equal or nearly so, near rusty ochraceous and darkening (more ochraceous) from the base upward, with a covering of ochraceous fibrils. Context solid becoming hollowed, rusty ochraceous within to the base, in base orange-fulvous to dark fulvous.

PILEUS SURFACE of fresh basidiocarps reddish brown with KOH.

SPORES 7-9 x 4.5 - 5.5 µm, in profile elliptic and obscurely- to somewhat inequilateral, in face view elliptic to ovate, verruculose, in KOH brownish to pale fulvous, in Melzer's light yellowish to yellowish brown. BASIDIA 4-spored, 24-35 x 5.5 - 7 µm, clavate to more or less ventricose, thin-walled, in KOH hyaline to pale vinaceous or containing particles and masses of deep red to vinaceous red pigment, in Melzer's light yellow or containing yellowish, brownish, orange, or reddish orange particles. PLEUROCYSTIDIA absent. CHEILOCYSTIDIA: 8-17 x 6-8 µm, slavate to broadly clavate, thin-walled, in KOH and Melzer's similar to basidia. SUBHYMENIAL HYPHAE compactly interwoven, cylindrical, 2-5 (-6) µm wide, thin-walled, in KOH and Melzer's as for the hyphae of the lamellar trama. TRAMAL HYPHAE OF LAMELLAE subparallel to slightly interwoven, cylindrical to more or less inflated, 5-25 µm wide, thin-walled, in KOH hyaline to pale vinaceous, in Melzer's yellowish. CUTICULAR HYPHAE OF PILEUS interwoven, more or less radially arranged, cylindrical to more or less inflated, 4.5 - 18 (-20) µm wide, thin-walled (up to 1.5 µm thick), in KOH hyaline to pale brownish or containing a more or less concentrated reddish brown, vinaceous brown, or olive-brown to olive pigment, some containing colorless droplets and granules or particles of bluish to bluish purple pigment, in Melzer's yellowish, yellow-brown, yellowish orange-brown, or yellow-orange, some containing droplets and colorless granules; pileocystidia absent. TRAMAL HYPHAE OF PILEUS interwoven, more or less radially arranged, cylindrical to inflated, 6-40 µm wide, thin-walled, in KOH hyaline to pale brownish or pale vinaceous in the lower portion, above (in the subcuticular zone) containing particles of bluish to bluish purple pigment, in Melzer's light yellowish below, above (in the subcuticular zone) as for the hyphae of the pileus cuticle. CORTICAL HYPHAE OF STIPE longitudinally arranged, subparallel to slightly interwoven, cylindrical to more or less inflated, 6-25 µm wide, thin-walled, in KOH hyaline or pale pinkish to pale vinaceous, some containing colorless droplets and granules, in Melzer's pale yellow to light yellow, often containing droplets and granules; caulocystidia present on the stipe apex, 35-88 x 8-15 µm, cylindrical to tapered, not well differentiated, thin-walled, in KOH and Melzer's as for the basidia. CORTINAL HYPHAE cylindrical, 3-10 (-12) µm wide, thin-walled, in KOH as for the hyphae of the stipe cortex or some containing a more or less concentrated reddish pigment, in Melzer's yellowish. CLAMP CONNECTIONS of the normal type, present throughout the basidiocarp.



FIGS. 1-2: Basidiospores (x 1800). 1. *Cortinarius cascadensis.* 2. *Cortinarius idahoensis.*

OLEIFEROUS HYPHAE present in the pileus trama and stipe cortex, in KOH slightly vinaceous to yellow-olive or olive, in Melzer's none observed. INTERHYPHAL PIGMENT DEPOSITS present in the pileus and lamellar trama and in the stipe cortex, in KOH red to vinaceous, sometimes fading to yellowish, in Melzer's yellow, orange, or reddish orange.

Gregarious under conifers on humus or rotted wood, September through November.

Collections examined: IDAHO: Bonner Co.: A.H. Smith 71073 (holotype, MICH). WASHINGTON: Clallam Co.: A.H. Smith 17294.

The most striking characteristic of this species is the presence of bluish to bluish purple particles of pigment in the hyphae of the cuticle and subcuticle of the pileus when mounted in KOH. This type of KOH reaction is not common in *Dermocybe* but does occur in *C. humboldtensis,* a species with olive-yellow lamellae, and *C. semisanguineus* (Fries) Gillet and its relatives, which have red lamellae.

Another interesting feature of *C. idahoensis* is the tendency of the pileus to lose moisture and fade (subhygrophanous) from reddish brown to olive-brown. This has been recorded for most of the specimens collected so far and seems to be a fairly constant characteristic. Truly hygrophanous pilei are not characteristic of *Dermocybe*.

The rusty ochraceous to orange ochraceous lamellae of *C. idahoensis* indicates some affinity with Dermocybes that have orange lamellae. At least two species with orange lamellae, *C. zakii* and *C. aurantiobasis* Ammirati and Smith, occur fairly commonly in areas of western North America where *C. idahoensis* has been found. *C. zakii* has deep orange lamellae when young, spores (6-) 6.5 - 8(-9) x 4 - 4.5 (-5) µm, and a coating of dull brown to vinaceous brown fibrils over the stipe surface. *C. aurantiobasis* is easily separated from *C. idahoensis* by its large spores (8.5 - 11(-12) x 5-6 µm).

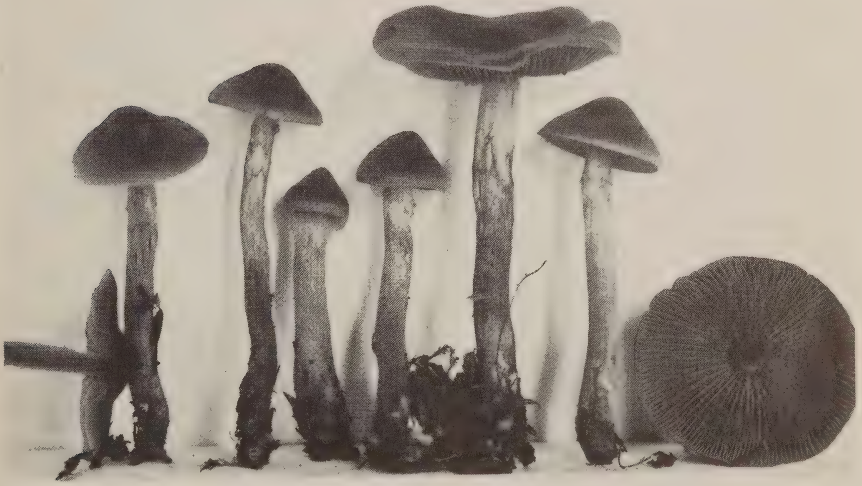


FIG. 3: *Cortinarius idahoensis*, x 1 (A.H. Smith 17294).

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# BELIZEAN HYPHOMYCETES

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## ABSTRACT

Fourteen papers are cited as references to the distribution of fungi in Belize (formerly British Honduras). This paper lists 45 species of hyphomycetes not previously recorded.

There is very little information available concerning the fungi of Belize. This paper lists 45 species of hyphomycetes which were collected there. The only imperfect fungus reported previously was the pycnidial stage of *Hypocrella turbinata* which was studied intensively by Karling (1936). The Belizean specimens were from the Orange Walk District. The earliest references to the fungi of Belize appear to be those of Murrill (1911 a, b, c; 1912; 1913; 1918 a, b). Murrill described three new species (*Lentinus subscyphoides*, *Hydrocybe hondurensis* and *Crepidotus bicolor*) and included notes on nine other species of agarics based upon collections made by M. E. Peck. From the collections of Mains, Smith (1940) described a new species, *Mycena hondurensis*, and listed three other agarics with notes. In a momograph of the genus *Prospodium*, Cummins (1940) proposed a new combination based upon a specimen collected in the Cayo District, a new species, *P. constrictum*, collected near Jacento Creek and named *Uraecium cydistae* as a new species based upon an aecial stage from Stann Creek. In addition another

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species of *Prospodium* was collected in the Belize District. Other reports are based upon collections made during the Summer of 1936 by E.B. Mains and C.L. Lundell. With few exceptions these were obtained from the Cayo District. Mains (1937, 1940a) described two new species and listed five other species of *Cordyceps*. In 1939, Mains listed 58 species in 11 genera of Uredinales as occuring in Belize. A new rust genus, *Tegillum*, was described by Mains (1940b).

Collections listed in this paper were made by W.E. Pryor in 1970, K.M. Augsburg-Luczynski in 1971 and R.A. McCord in 1973. All three were students at Western Illinois University who were participants in the Tropical Biology Program of the Associated Universities for International Education. The designations WEP, KMAL, and RAM refer to these collectors. Collections not so designated were made by the author in 1969 and 1970. The specimens are deposited in the Mycological Collection of Western Illinois University (WMI).

1. *Acrodictys erecta* (Ell. & Ev.) M.B. Ellis, Mycol. Pap., 79:12, 1961.

   On dead palm, Columbia Forest Station, Toledo District, 7/28/70, EFM No. 1320b.

2. *Acrodictys globulosa* (Toth) M.B. Ellis, Mycol. Pap., 103:34, 1965.

   On dead wood, Central Farm, Cayo District, 7/25/69, EFM No. 1211.

3. *Acrogenospora sphaerocephala* (Berk. &Br.) M.B. Ellis, Dematiaceous Hyphomycetes, p. 114, 1971.

   On decaying bark, Columbian Forest, between San Jose and San Antonio, Toledo District, 7/30/70, (WEP), EFM No. 1334.

4. *Aspergillus niger* van Tiegh., Annls. Sci. Nat. (Bot.), Ser. 5, 8:240, 1867.

   On decaying fruit, Long Cay, Glovers Reef, Belize District, 7/25/73, (RAM), EFM No. 1565.

5. *Beltrania rhombica* O. Penzig, Nuovo G. bot. ital, 14:72, 1882.

   On dead leaves, Long Cay, Glovers Reef, Belize District, 7/22/73, (RAM), EFM No. 1561.

6. *Clonostachys cylindrospora* Arnaud, Bull. Soc. Mycol. France 68:196, 1952. [nomen nudum]

   On decaying seed coat, Roaring Creek, Cayo District, 6/28/71, (KMAL), EFM No. 1414b.

7. *Codinaea assamica* (Agnihothrudu) Hughes & Kendrick, N.Z. Jl. Bot., 6:334, 1968.

   On dead wood, Columbia Forest Station, Toledo District, 7/9/71, (KMAL), EFM No. 1430; On dead leaf, Blancaneaux Lodge, Cayo District, 7/7/73, (RAM), EFM No. 1519.

8. *Corynespora leptoderridicola* Deighton & M.B. Ellis, Mycol. Pap., 65:7, 1957.

   On dead bark, Columbian Forest, between San Jose and San Antonio, Toledo District, 8/1/70, (WEP), EFM No. 1378a.

9. *Corynespora siwalika* (Subram.) M.B. Ellis, Mycol. Pap., 82:53, 1961.

   On dead twig, Columbian Forest, between San Jose and San Antonio, Toledo District, 8/1/70, (WEP), EFM No. 1368a.

10. *Curvularia lunata* (Wakker) Boedijn, Bull. Jard. bot. Buitenz., III, 13(1):127, 1933.

    On dead *Paspalum conjugatum*, Central Farm, Cayo District, 7/25/69, EFM No. 1208.

11. *Dendryphion nanum* (C.G. Nees ex S.F. Gray) Hughes, Can. J. Bot., 36:761, 1958.

    On dead wood and bark, Columbian Forest, between San Jose and San Antonio, Toledo District, 7/30/70, (WEP), EFM No. 1335a.

12. *Dictyoarthrinium sacchari* (Stevenson) Damon, Bull. Torrey bot. Club, 80:164, 1953.

    On dead cane stems, Columbia Forest Station, Toledo District, 7/28/70, EFM No. 1323b.

13. *Dictyosporium heptasporum* (Garov.) Damon, Lloydia 15:118, 1952.

    On dead woody branch, Columbia Forest Station, Toledo District, 7/28/70, EFM No. 1317b.

14. *Dictyosporium zeylanicum* Petch, Ann. Roy. Bot. Gard. Peradeniya 6:252, 1917.

    On dead wood, Columbian Forest, between San Jose and San Antonio, Toledo District, 7/31/70, (WEP) EFM No. 1361b.

15. *Exosporium ampullaceum* (Petch) M.B. Ellis, Mycol. Pap., 82:32, 1961

    On dead woody branch, Columbia Forest Station, Toledo District, 7/28/70, EFM No. 1317a.

16. *Exosporium phyllantheum* (Sacc.) M.B. Ellis, Mycol. Pap., 82:29, 1961

    On dead wood, Columbian Forest, between San Jose and San Antonio, Toledo District, 8/1/70, (WEP), EFM No. 1370b.

17. *Gyrothrix circinata* (Berk. & Curt.) Hughes, Can. J. Bot., 36:771, 1958.

    On palm, Southwest Cay, Glovers Reef, Belize District, 7/27/73, (RAM), EFM No. 1567.

18. *Harpographium fasciculatum* Saccardo, Michelia, 2:33, 1880.

    On dead woody branches, Central Farm, Cayo District, 7/25/69, EFM No. 1210; On dead woody branches, Columbian Forest, Toledo District, 7/28/70, EFM No. 1326; On dead woody branches, Columbia Forest Station, Toledo District, 7/28/70, EFM No. 1329.

19. *Helicoma intermedium* (Penzig & Saccardo) Linder, Annals Mo. Bot. Gard., 16:306, 1929.

On coconut husk, Wilson's Motel grounds, Corozal, Corozal District, 7/23/69, EFM No. 1202.

20. *Helicosporium aureum* (Corda) Linder, Annals Mo. Bot. Gard. 16:279, 1929.

On dead wood, Blancaneaux Lodge, Cayo District, 7/9/73, (RAM), EFM No. 1528.

21. *Melanographium cookei* M.B. Ellis, Mycol. Pap., 93:19, 1963.

On dead wood, Columbian Forest, between San Jose and San Antonio, Toledo District, 8/1/70, (WEP), EFM No. 1370a.

22. *Periconia cookei* Mason & M.B. Ellis, Mycol. Pap. No. 56, p. 72, 1953.

On dead herbaceous stems, Central Farm, Cayo District, 7/25/69, EFM No. 1215; On dead herbaceous stems Columbian Forest, between San Jose and San Antonio, Toledo District, 8/1/70, (WEP), EFM No. 1376.

23. *Periconia lateralis* Ell. & Ev., J. Mycol., 2:104, 1886.

On dead cane stems, Columbia Forest Station, Toledo District, 7/28/70, EFM No. 1323a.

24. *Periconia minutissima* Corda, Icones fugorum, 1, p. 19, 1837.

On dead woody branch, Altun Ha, Belize District, 7/23/69, EFM No. 1207.

25. *Phaeoisaria clematidis* (Fuckel) Hughes, Can. J. Bot., 36:795. 1958.

On dead wood, Columbia Forest Station, Toledo District, 7/27/70, (WEP), EFM No. 1309; On dead wood, Columbian Forest, between San Jose and San Antonio, Toledo District, 8/1/70, (WEP), EFM No. 1381.

26. *Phragmospathula phoenicis* Subram. & Nair, Antonie Van Leeuwenhoek, 32:384, 1966.

On palm, Southwest Cay, Glovers Reef, Belize District 7/27/73, (RAM), EFM No. 1577.

27. *Pithomyces chartarum* (Berk. & Curt.) M.B. Ellis, Mycol. Pap., 76:13, 1960.

On dead herbaceous stem, Altun Ha, Belize District, 7/23/69, EFM No. 1204.

28. *Pleurophragmium simplex* (Berk. & Br.) Hughes, Can. J. Bot., 36:798, 1958.

On dead woody branch, Columbian Forest, between San Jose and San Antonio, Toledo District, 8/1/70, (WEP), EFM No. 1369b; On dead woody branch, Southwest Cay, Glovers Reef, Belize District, 7/27/73, (RAM), EFM No. 1572.

29. *Sepedonium ampullosporum* Damon, Mycologia, 44:91, 1952.

On unidentified fleshy fungus, 4 miles north of Blancaneaux Lodge, Cayo District, 6/30/71, (KMAL), EFM No. 1418.

30. *Solheimia costaspora* Morris, Mycopath. Mycol. Appl., 33:181, 1967.

On dead herbaceous stem, Columbian Forest, between San Jose and San Antonio, Toledo District, 7/30/70, (WEP), EFM No. 1338.

31. *Spadicoides grovei* M.B. Ellis, Mycol. Pap., 93:12, 1963.

On dead woody branch, Columbian Forest, between San Jose and San Antonio, Toledo District, 8/1/70, (WEP), EFM No. 1369a.

32. *Sporidesmium adscendens* Berkeley, Ann. Nat. Hist., 4, p. 291, 1840.

On dead twig, Rio Frio, Cayo District, 7/22/70, (WEP) EFM No. 1304.

33. *Sporidesmium parvum* (Hughes) M.B. Ellis, Mycol. Pap., 70:69, 1958.

On dead bark, Columbian Forest, between San Jose and San Antonio, Toledo District, 7/31/70, (WEP), EFM No. 1359; On dead herbaceous stem, along w. highway, 54 miles from Belize City, Belize District, 6/28/71, (KMAL), EFM No. 1411.

34. *Sporoschisma mirabile* Berk. & Br., apud Berk. In Gard. Chron., 1847:540, 1847.

On dead palm, Columbia Forest Station, Toledo District, 7/28/70, EFM No. 1320a.

35. *Stachybotrys nilagirica* Subram., Proc. Indian Acad. Sci., 46:330, 1957.

On dead bark, Columbian Forest, between San Jose and San Antonio, Toledo District, 8/1/70, (WEP), EFM No. 1378b; On dead herbaceous stem, Columbian Forest, between San Jose and San Antonio, Toledo District, 7/31/70, (WEP), EFM No. 1351.

36. *Stachybotrys theobromae* Hansf., Proc. Linn. Soc. Lond., 1942-1943:45, 1943.

On dead bark, Columbian Forest, between San Jose and San Antonio, Toledo District, 8/1/70, (WEP), EFM No. 1373.

37. *Stachylidium bicolor* Link ex S.F. Gray, Syst. Mycol. 3:391, 1832.

On dead wood, Columbian Forest, between San Jose and San Antonio, Toledo District, 7/30/70, (WEP), EFM No. 1337.

38. *Stilbella cinnabarina* (Mont.) Wollenweber, Angew, Bot. 8:195, 1926.

On dead bark, Columbia Forest Station, Toledo District, 7/27/70, (WEP), EFM No. 1307; On dead bark, Altun Ha, Belize District, 7/19/70, (WEP), EFM No. 1301; On dead woody branches, Wilson's Motel Grounds, Corozal, Corozal District, 7/23/69, EFM No. 1200.

39. *Stromatographium stromaticum* (Berk.) v. Höhnel, Denkschr. Kaiserl. Akad. Wiss., Math.-Naturwiss. Kl. 83:27, 1907.

On dead wood, Columbia Forest Station, Toledo, District, 7/28/70, EFM No. 1322; On dead wood, Columbia Forest Station, Toledo District, 7/8/71, (KMAL), EFM No. 1427.

40. *Tharoopama trina* Subram., J. Indian Bot. Soc., 35:85, 1956.

On dead wood, Altun Ha, Belize District, 7/19/70, (WEP), EFM No. 1302; On dead wood, Columbian Forest, between San Jose and San Antonio, Toledo District, 7/31/70, (WEP), EFM No. 1361a.

41. *Torula herbarum* (Pers.) Link ex S.F. Gray, Nat. Arr. Br. Pl., 1:557, 1821.

On dead herbaceous stem, Central Farm, Cayo District, 7/25/69, EFM No. 1213; On dead bark, Belize City, Belize District, 7/5/73, (RAM), EFM No. 1505.

42. *Virgaria nigra* (Link) Nees ex S.F. Gray, Nat. Arr. Br. Pl., 1:553, 1821.

On dead herbaceous stems, Columbian Forest, between San Jose and San Antonio, 7/31/70, (WEP), EFM No. 1355a.

43. *Virgatospora echinofibrosa* Finley, Mycologia, 59:538, 1967.

On dead herbaceous stem, Columbian Forest, between San Jose and San Antonio, Toledo District, 7/31/70, (WEP), EFM No. 1350; On dead bark, Columbian Forest, between San Jose and San Antonio, Toledo District, 8/1/70, (WEP), EFM No. 1378a.

44. *Volutina concentrica* Penz. & Sacc., Malpighia, P. 257, 1901.

On dead palm, Columbian Forest, between San Jose and San Antonio, Toledo District, 8/1/70, (WEP), EFM No. 1371; On decaying seed coat, Roaring Creek, Cayo District, 6/28/71, (WEP), EFM No. 1414a.

45. *Xenosporium berkeleyi* (Curtis) Pirozynski, Mycol. Pap., 105:27, 1966.

On dead palm, Altun Ha, Belize District, 7/19/70, (WEP), EFM No. 1303.

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# A NEW HYPHOMYCETE ON SCLEROTIA OF SCLEROTINIA SCLEROTIORUM

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## SUMMARY

*Sporidesmium sclerotivorum*, a new dematiaceous hyphomycete on sclerotia of *Sclerotinia sclerotiorum*, is described and illustrated and its relationships are discussed.

During a study of lettuce drop disease, caused by *Sclerotinia sclerotiorum* (Lib.) deBary, an unidentified dematiaceous hyphomycete was consistently observed. The fungus was first isolated from a field at Beltsville, Maryland, and later from fields at Vineland and Cedarville, New Jersey, and from a muck field in Oswego County, New York. It appears to be a pathogen destructive to sclerotia, digesting the nonmelanized tissues within the peridium. Its potential as a biological control agent for the lettuce drop organism is great and is under study. Because this fungus cannot be placed in any presently known species, it is here described as a new species.

Names of herbaria are abbreviated in accordance with the Index Herbariorum (Holmgren and Keuken, 1974).

*Sporidesmium sclerotivorum* Uecker, Ayers, et Adams, sp.nov.

Coloniae super *Sclerotiniae sclerotiorum* sclerotia efformantes et conidiorum stratum et byssum laxum in aere effusum. Conidiophori simplices vel ramosi, erecti, leves, pallide vel sature brunnei, plerumque vel ipsi vel rami terminalese cellulis duobus vel tribus compositi, 14-25 X 4-5µm, ubi percurrentes longiores, cellula terminali rami cuiusque conidiogena. Cellulae conidiogenae integratae, holoblasticae. Conidia solitaria, cellularum conidiogenarum apices inflati orta, a prolongatione apicali elongata, pallide vel mediocriter brunnea, levia, phragmospora, apicibus rotundatis, apicem et basim versus leniter attenuata, basibus truncatis, cellula apicali atque basali mediis pallidiores, (5-)6(-7)-septatae, septis quam tunica saturioribus, 60-92 X 6-8µm.

In hyphis eisdem ac *Sporidesmii* vel sejunctis orta *Selenosporellae* fructificatio. Huius conidiophori simplices vel ramosi, (28-) 50-75 (-100)µm longi, ad basim (4-)5-7(-9)µm lati. Cellulae conidiogenae in verticillis binis, trinis, quaternis, vel quinis e conidiophoro vel eius ramulis ortae, 12-35µm longi, ad basim 4µm, apicem versus attenuatae, 1-2µm latae, parte terminali denticulas paucas vel multas conidiogenas producente. Conidia hyalina, stricta, vel fructui *Musae* forma similia vel fusiformia vel cylindrica, 7-9 X 0.8-1.0µm.

Holotypus FAU-320, BPI 71877; isotypi in DAOM, NYBG, et IMI.

Colonies forming both a loose to thick mat of conidia (Fig. 1) and loose aerial growth on sclerotia of *Sclerotinia sclerotiorum*. Mycelium both superficial and immersed, superficial mycelium pale to mid brown, cells of immersed mycelium irregular and contorted, dark brown to black. Conidiophores same diameter as hyphae or broader, simple or branched, erect, superficial, smooth, pale to dark brown, the conidiophore or its terminal branches usually consisting of two or three cells, 14-25 X 4-5µm, longer when proliferating percurrently, terminal cell of each branch conidiogenous. Conidiogenous cells integrated. Conidia single, developing holoblastically as blown-out tips of conidiogenous cells and elongating by apical extension, light to mid brown, smooth, phragmoseptate, tips rounded, tapered gently toward base and apex, base truncate, apical and basal cells paler than intermediate cells, (5-)6(-7) septate, septa darker than side walls, 60-92 X 6-8μm, germinating usually from either or both end cells but sometimes from an intermediate cell. A *Selenosporella* state developing on the same hyphae as the *Sporidesmium* state or on separate hyphae, both on the host and on other media. Conidiophores of *Selenosporella* state simple or branched, (28-)50-75(-100)μm long and (4-)5-7(-9)μm wide at base. Conidiogenous cells in whorls of two to five on the conidiophore or its branches, 12-35μm long and 4μm wide at base, tapered to 1-2μm at terminus. Terminal portion with few to many minute denticles that bear conidia. Conidia hyaline, narrow, banana-shaped to fusiform to cylindric, 7-8 X 0.9-1.0μm.

This fungus was obtained from sclerotia of *S. sclerotiorum* screened from soil and placed on moist filter paper in petri dishes. Conidia were produced both on the sclerotia and on the filter paper. For routine cultivation of the fungus in the laboratory, sclerotia grown on oatmeal and transferred to sand in petri dishes were inoculated with a suspension of conidia. The sclerotia were removed from the sand after two weeks and placed on moist filter paper. Conidia were produced in two to three weeks and continued to form for another two weeks. The fungus produces conidia rapidly and profusely on unsterilized sclerotia and much more slowly on sterilized sclerotia. It grows slowly on water agar containing ground up sclerotia of *Sclerotinia sclerotiorum,* the only medium on which it has been cultivated.

The diagnostic features of *Sporidesmium sclerotivorum* are its gently tapered, phragmoseptate conidia (Fig. 2) that form as blown-out ends of the conidiophores (Figs. 3-7); its distinctive simple (Figs. 3-7) or branched (Figs. 2,8,9) conidiophores that sometimes proliferate percurrently (Fig. 8); its possession of a *Selenosporella* state (Figs. 9-12) that differs from any previously described *Selenosporella* state; and its occurrence as a hyperparasite on sclerotia of *Sclerotinia sclerotiorum*.

This fungus belongs among the few dematiaceous hyphomycetes that produce holoblastic, phragmoseptate conidia as blown-out ends of conidiophores that proliferate percurrently through the bases of empty conidiogenous cells. When the first conidium is shed, it leaves behind the empty conidiogenous cell (Fig. 2, arrow). Successive proliferations are percurrent, i.e., the conidiophore grows through and beyond the empty conigiogenous cell. A conidium is produced on each successive proliferation of the conidiophore. Each proliferation extends through the complete septum at the base of the empty conidiogenous cell whereas in most dematiaceous hyphomycetes that proliferate percurrently only a half-septum remains when the conidium secedes. Conidiophores of *Sporidesmium subulatum* (Cke. & Ellis) Hughes, *S. inflatum* (Berk. & Rav.) M. B. Ellis, *S. flexum* Matsushima, *Teratosperma singulare* Syd., *T. cornigera* (Ell. & Ev.) M. B. Ellis, *T. pulchrum* (Ell. & Ev.) M. B. Ellis, and members of a few other genera proliferate similarly. In these, however, the conidiophores are simple and usually proliferate percurrently whereas those of *Sporidesmium sclerotivorum* are often branched and proliferate percurrently only occasionally.

In our opinion *Sporidesmium sclerotivorum* is congeneric with *S. subulatum, S. inflatum,* and *S. flexum.* The difficulty in placing this species in *Sporidesmium* is that no type or authentic material for the genus is extant (Ellis, 1958). Furthermore, in *S. subulatum* and its closest relatives proliferation of the conidiophores is percurrent through the complete septum at the base of the empty conidiogenous cell whereas in the other approximately 120 members of the genus, proliferation, if it occurs at all, is from the apical cell which bears only a half-septum. These few species probably do not belong in *Sporidesmium* but should remain there until a thorough

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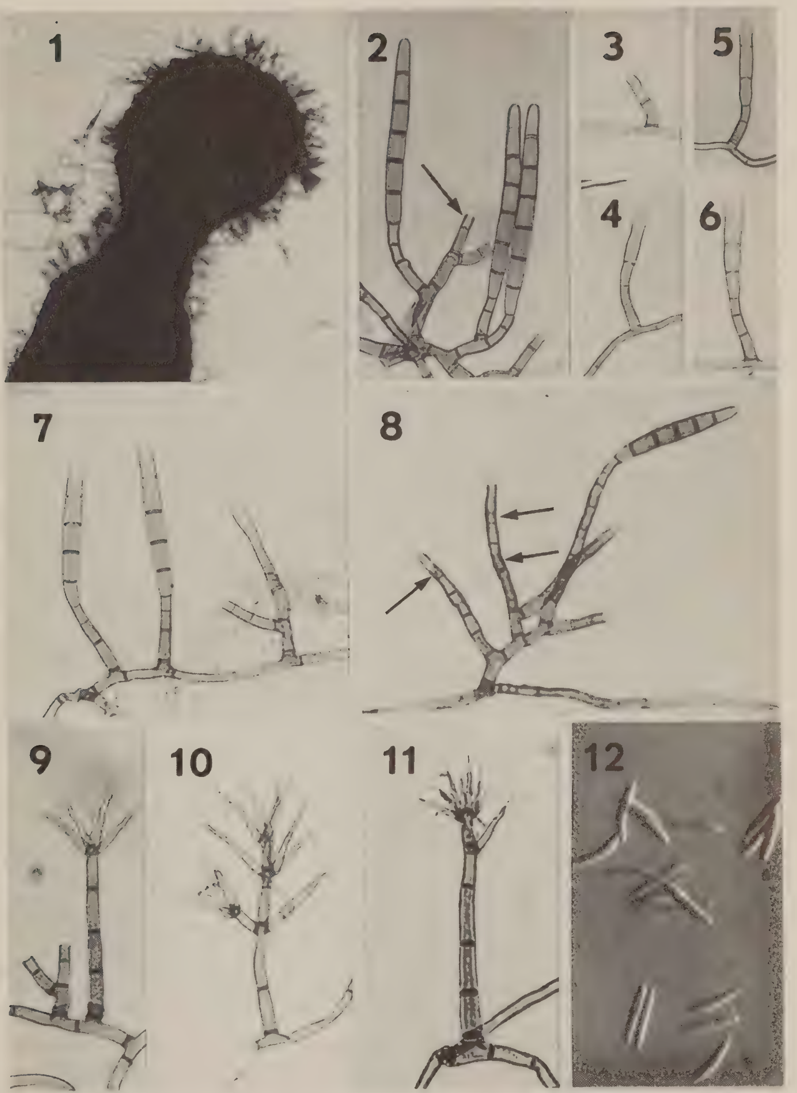
Figs. 1-12. *Sporidesmium sclerotivorum.* (All Figs. X350 unless otherwise stated.) Fig. 1, conidia on sclerotium of *Sclerotinia sclerotiorum,* X40. Fig. 2, Conidiophores with mature conidia, and empty conidiogenous cell (arrow) left when first conidium secedes. Figs. 3-7, Stages in development of conidia; 3, holoblastic conidium initial beginning to form as blown-out end of conidiophore; 4, conidium initial one-septate; 5, conidium initial two-septate; 6, larger conidium initial; 7, two conidia nearly mature. Fig. 8, conidiophores developed percurrently through empty conidiogenous cells (arrows). Figs. 9-12,



*Selenosporella* state of *Sporidesmium sclerotivorum;* 9, single whorl of conidiogenous cells on conidiophore that developed on same hypha with conidiophore of *Sporidesmium* state; 10, multiple whorls of conidiogenous cells, lower whorl branched; 11, conidia attached to conidiogenous cells; 12, conidia, interference contrast, X1000.

monographic treatment of the entire complex can place them correctly. Hughes (1971) stated his belief that *S. subulatum* would be more satisfactorily included in *Teratosperma* but did not make the transfer. *S. sclerotivorum* could also be placed in *Teratosperma* but the conidia lack the distinctive basal appendages found in all other species now included in *Teratosperma*.

None of the fungi mentioned has been reported in association with sclerotia of *Sclerotinia sclerotiorum*. Species of *Teratosperma,* however, usually are found on other fungi or on algae (Ellis, 1957).

Five species of *Selenosporella* have been described, but none has been connected with a phragmosporous hyphomycete state. Conidiogenous cells of *S. curvispora* MacGarvie (MacGarvie, 1968), *S. nandiensis* Sutton (Sutton, 1973b), and *S. acicularis* Sutton & Hodges (Sutton and Hodges, 1977) are discrete and are arranged in whorls at the apex of the conidiophore or its branches or just below the cross wall below the apex. Conidia of *S. curvispora* are slightly curved, 4-7 X 0.5µm; those of *S. nandiensis* are falcate, 10-16 X 2.5-3µm; and those of *S. acicularis* are acicular, 9.5-14.5 X 1µm. The conidiogenous cells of both *S. cymbiformis* Sutton (Sutton, 1973a) and *S. falcata* Sutton (Sutton, 1973a) are terminal and integrated. The conidia of *S. cymbiformis* are boat-shaped and 3.5-4.5µm long, whereas those of *S. falcata* are sickle-shaped and are 8.5-11 X 1.5µm.

*Selenosporella* states have been reported, without epithets, for only two fungi that have phragmosporous conidial states. In the *Selenosporella* state of *Endophragmia dimorphospora* Awao & Udagawa (Awao and Udagawa, 1974), the conidia are 6-8 X 0.5-0.8µm and the tips of the conidiogenous cells are inflated into irregularly nodulose enlargements with many minute denticles on which the conidia are borne. Matsushima (1975) illustrated but did not describe the *Selenosporella* state of *Teratosperma singulare*. The conidiogenous cell is shown with a rather short, stout basal portion and a terminal part on which four longitudinal rows of conidia develop. The conidia are shown as 16-21 X about 0.9µm, nearly straight or curved. The original description (Sydow and Sydow, 1909) did not mention a secondary conidial state for this fungus. Matsushima (1975) illustrated a *Verticicladiella* state for *Endophragmiella canadensis* (Ell. & Ev.) Sutton (erroneously cited as *Endophragmia canadensis*) but this state could be interpreted as a *Selenosporella*.

Hughes reported *Selenosporella*-like secondary conidial states in *Sporidesmium subulatum* (Hughes, 1951) and in *Ceratosporium fuscescens* Schw. (Hughes, 1964), but did not refer them to a generic name. Secondary conidia of *S. subulatum* were 10 X 0.8μm and were reported developing only from germ tubes from the apex and base of the primary conidia. Sporogenous cells bear apices roughened with minute conidial scars. In *C. fuscescens* whorled conidiogenous cells develop at or near the tip of the germinating spores or from repent hyphae, in which case they are arborescent. The conidia are 9-12.6 X 0.8μm, continuous, hyaline, curved.

Sutton (1973a) discussed the nature of the conidiogenous apparatus in *Selenosporella falcata* but could not determine whether the small pegs were produced sympodially and holoblastically or were phialides. We have also been unable to decide. The conidiogenous loci are very small and should be studied with the electron microscope.

## ACKNOWLEDGEMENTS

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# STUDIES IN THE LICHEN FAMILY PHYSCIACEAE. II
# THE GENUS *PHAEOPHYSCIA* IN NORTH AMERICA

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## SUMMARY

*The lichen genus* Phaeophyscia *Moberg is distinguished from* Physcia *by the lack of atranorin, a generally more brownish coloration, and the paraplectenchymatous lower cortex. Nineteen species of* Phaeophyscia, *including newly described* Ph. hirtella *Essl., are currently known from North America.* Physcia melanchra *Hue,* Physcia nepalensis *Poelt,* Phaeophyscia cernohorskyi *(Nádv.) Essl.,* Ph. endococcinodes *(Poelt) Essl., and* Ph. imbricata *(Vain.) Essl. are reported for the first time from North America. A key to the species of* Phaeophyscia *in North America and a discussion of each species are provided.*

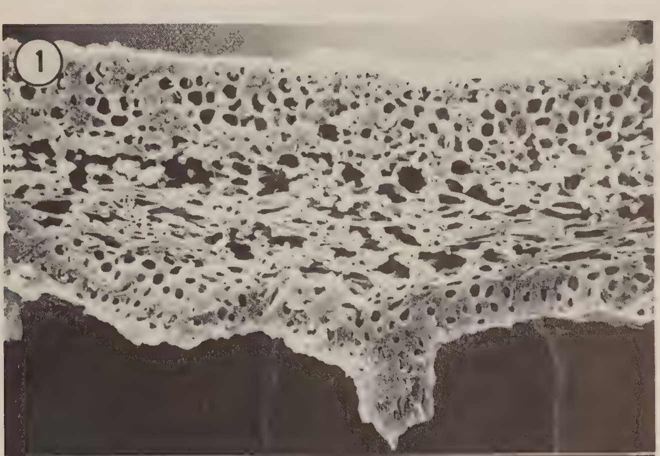
Since the time of Linnaeus and his monogeneric *Lichen*, the genus concept in lichenology has undergone a slow but steady process of narrowing and refinement. The last two decades have seen a decided acceleration of this process and the number of segregate genera recognized, particularly in such widespread macrolichen families as the Parmeliaceae and Physciaceae, is growing steadily.

Increasingly, lichenologists are acknowledging the artificiality of combining numerous, often vastly disparate species into large and cumbersome genera, sometimes based on little more than similarities in habit. An excellent example of this general trend is found in the genus *Physcia*. What was recognized only a few years ago as the single genus *Physcia* is today generally divided into five distinct genera: *Physcia*, *Physconia*, *Physciopsis*, *Dirinaria*, and *Pyxine*. These segregates were based on various characters involving thallus habit, anatomy of the upper and lower cortices, apothecial anatomy, spore type, conidium type, and chemistry (e.g., Poelt, 1965). The general acceptance of these segregate physcioid genera reflects a healthy trend becoming apparent throughout lichen taxonomy today.

## The Genus *Phaeophyscia* And Its Delimitation

Very recently another genus has been added to the list of *Physcia* segregates. In his fine paper on Fennoscandian *Physciae*, Moberg (1977) erected the new genus *Phaeophyscia* to encompass those species that lack atranorin and often have a brownish coloration. This delimitation corresponds approximately to what was known variously in the past as "the *Physcia orbicularis* group," or as some infrageneric taxon bearing the epithet *Obscura* (section, subsection, or "group"). In addition to the lack of atranorin and the usually brownish coloration, Moberg cited other correlative characters delimiting *Phaeophyscia* from *Physcia*. In his investigations, he found that all the brownish, atranorin-absent species possess ellipsoid conidia less than 4 μm in length while all of the gray, atranorin-present species (*Physcia* sensu stricto) possess cylindrical conidia typically greater than 4 μm in length. Because of this apparent absolute correlation, Moberg chose to emphasize conidium type in his delimitation of *Phaeophyscia*.

My own investigations with this group confirm Moberg's findings regarding the correlation of atranorin production and conidium type. However, my interpretation of the data and thus my delimitation of the genus *Phaeophyscia* differ slightly from Moberg's. The majority of the species that Moberg would include in *Phaeophyscia* (by virtue of their lack of atranorin and their ellipsoid conidia) also have distinctly paraplectenchymatous lower cortices (see Fig. 1), whereas the majority of those he would leave in *Physcia* have distinctly prosoplectenchymatous lower cortices (sensu Hale, 1975; see Fig. 2). There is one species group, however, the *Physcia luganensis* group, which is anomalous with regard to these characters. It is non-Fennoscandian and therefore not dealt with directly by Moberg, but only by implication. It is with regard to the placement of this group that my delimitation of *Phaeophyscia* differs somewhat



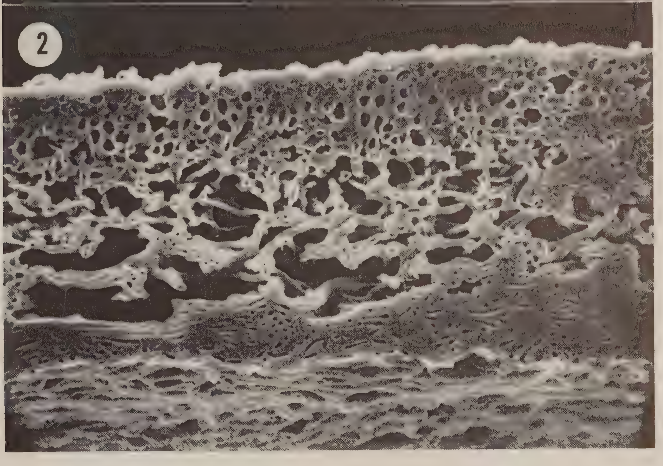


Figure 1. Scanning electron micrograph of a longitudinal section through a lobe of *Phaeophyscia pusilloides* [*Mereschkowsky* (US)], X400.

Figure 2. Scanning electron micrograph of a longitudinal section through a lobe of *Physcia luganensis* [*Wetmore 22984*(US)]

from Moberg's.

As a result of their lack of atranorin and their possession of short, ellipsoid conidia, the four related species of the *Physcia luganensis* group (including also *Physcia melanchra, Ph. nepalensis,* and *Ph. denigrata*) would be included in *Phaeophyscia* according to Moberg's delimitation. However, the four have other characters that place them closer to *Physcia* than to *Phaeophyscia*. Each has the distinctly prosoplectenchymatous lower cortex (Fig. 2) so characteristic of *Physcia* sensu stricto. Also, when fertile, the base of the apothecia lack any evidence of the "corona" of rhizines common to virtually all *Phaeophysciae*. Yet the dogmatic acceptance of conidium type as the single defining character between *Physcia* and *Phaeophyscia* would result in the unnatural placement of these four species into *Phaeophyscia*. Such placement would result, for instance, in the separation into different genera of *Physcia stellaris* (L.) Nyl. and *Ph. nepalensis*, two species nearly identical except for the production by one (the former) of atranorin. When making generic delimitations, it is necessary to consider the entire array of available characters rather than attempting to put undue emphasis on any single character, such as conidium type. At the very least, these four species form a somewhat anomalous group and no improvement would be made by transferring them to *Phaeophyscia*. Because of their superficial similarity to that genus, however, they are discussed below and are included in the key.

The following table will serve to summarize the distinguishing characteristics of the two genera *Phaeophyscia* and *Physcia* as conceived by me. As delimited here, *Physcia* still contains several anomalous groups which would fit even less well into *Phaeophyscia* (e.g., the *Physcia tribacioides* Nyl. group).

| *PHAEOPHYSCIA* | *PHYSCIA* |
|---|---|
| Lower cortex paraplectenchymatous | Lower cortex usually prosoplectenchymatous |
| Lower cortex usually black | Lower cortex usually white or tan |
| Atranorin absent; upper cortex K- | Atranorin usually present in the upper cortex and sometimes in the medulla; upper cortex usually K+ yellow |
| Medullary anthraquinones frequent | Medullary anthraquinones unknown |
| Excipular cortex often with ± darkened rhizines around base of apothecia; hyaline cortical hairs in some | Excipular cortex mostly lacking rhizines; cortical hairs lacking |

## Spore Character And Species Delimitation

Although the basic spore type for virtually all the Physciaceae appears to be the dark (gray or brown), two-celled spore, a number of variations on the theme have been described (Poelt, 1965). These variations involve primarily the relation between spore size, the size and shape of the cell lunina, and the resulting thickness of the spore wall. Such variations in spore type have been shown to be significant and useful characters for use in the delimitation of many of the genera in the Physciaceae (Poelt, 1965, 1966; Kashiwadani, 1975; Moberg, 1977). Within the genera *Physcia* and *Phaeophyscia*, the most frequently used spore character has been size differential. No consistent spore character differences exist between the two genera. However, although they were not used by Kashiwadani (1975) or Moberg (1977), two basically different and taxonomically useful types of spore are found among the various species of *Physcia* and *Phaeophyscia*:

*Physcia*-type (Figs. 3-8): This type of spore is characterized by very unevenly thickened spore walls, with the end walls and usually the adjacent walls (comprising the septum) notably thicker than the side walls. Typically the lumina of such cells are angular, the pair of lumina in a single spore then approximating an hour-glass shape. Occasionally the lumina of *Physcia*-type spores are somewhat rounded instead of angular but even then they are generally broader than they are long and the side walls are therefore decidedly thinner than the end walls.

*Pachysporaria*-type (Figs. 9-13): Spores of this type are characterized by spore walls that are only slightly unevenly thickened, the side walls being slightly or not at all thinner than the end walls. The lumina of such spores tend to be rounded and nearly isodiametric or (more often) longer than they are broad. Occasionally secondary locules will form in the walls at the opposite ends of the spores.

The existence and usefulness of these two spore types within *Physcia* (including *Phaeophyscia*) was discussed in some detail by Poelt (1974) who utilized them as species level characters, for instance, in separating *Physcia endococcina* (with *Physcia*-type spores) from *Physcia endococcinodes* (with *Pachysporaria*-type spores). My own observations have shown that species defined on other morphological and/or chemical characters seem always to have one spore type

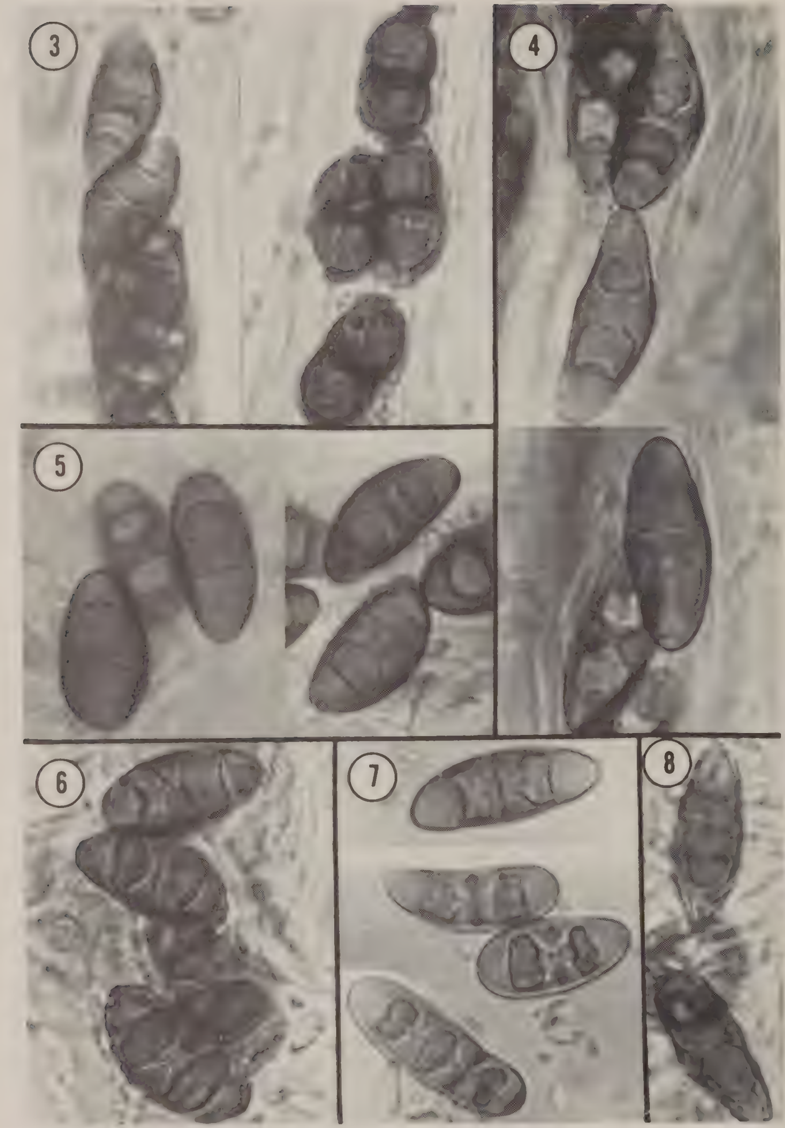


Fig. 3-8. *Physcia*-type ascospores, all X 1100. -3. *Phaeophyscia decolor*, mature (left) and postmature (right), *Esslinger 5216* (Herb. Esslinger). -4. *Ph. erythrocardia*, *Pringle 10718* (US). -5. *Ph. imbricata* from Japan, *Kashiwadani 9536* (TNS). -6. *Ph. imbricata* from North America,

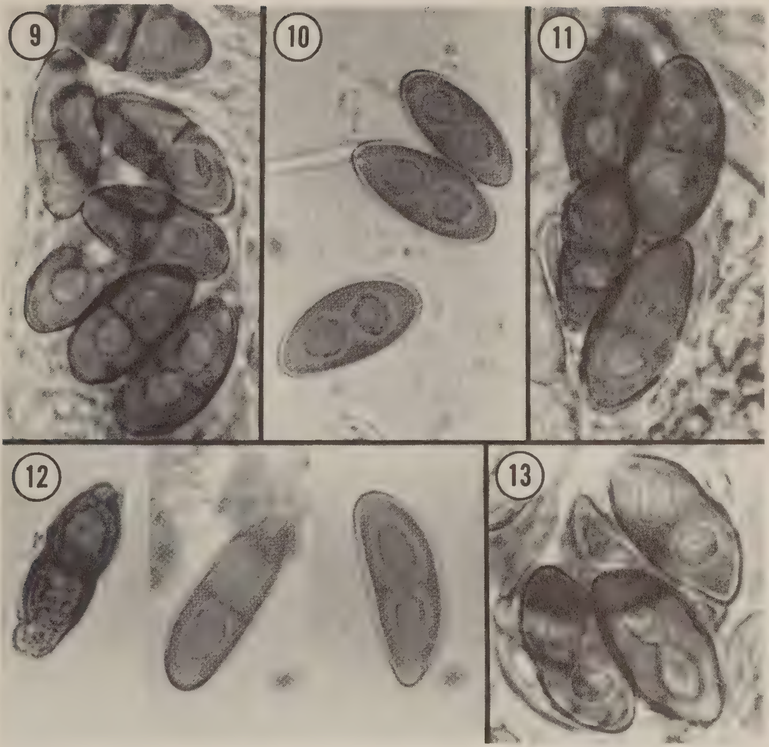


Fig. 9-13. *Pachysporaria*-type ascospores, all X1100. -9. *Physcia lacinulata, Pittier 5064* (G, lectotype). -10. *Ph. trichophora, Kashiwadani 8913* (TNS). -11 & 13. *Ph. denigrata, Asahina 32* (TNS). -12. *Phaeophyscia laciniata* Essl. ined., postmature (left) and mature, *Hale 31529* (US).

or the other(e.g., *Phaeophyscia adiastola* and *Ph. rubropulchra*; see Esslinger, 1977). In most cases other correlative characters in addition to the spore type differences can be found. I therefore support Poelt's use of spore type differences as a primary species level character difference.

*Hall 15* (FH). -7. *Ph. leana, Lea* (FH-Tuck, holotype), note the one anomalous 3-celled spore. -8. *Physcia nepalensis, Poelt L1457* (M, holotype).

Little difficulty exists in distinguishing between typical, mature spores of the *Physcia*- and *Pachysporaria*-types. As pointed out by Poelt (1974), however, the spores of each type go through a series of premature and postmature stages in which they can be difficult or impossible to distinguish. The premature spores are usually easy to recognize by their smaller size and paler color; the postmature spores by their generally darker (more brown than gray) color and generally irregular appearance (see Figs. 3 & 12 in this paper and Poelt's Fig. 1). Premature and postmature spores are almost always in a definite minority in a given apothecial section.

## Chemistry

The Physciaceae, and especially the genera *Physcia* and *Phaeophyscia*, exhibit far less of the diversity of different substances found in some other macrolichen families (e.g., the Parmeliaceae), however most species are characterized by a constant chemistry (or lack thereof). With the exception of atranorin, no depsides or depsidones are known in either of these two genera. Characteristic substances include anthraquinones, fatty acids, and terpenoid compounds such as zeorin. All chemical analyses for this paper were performed using thin-layer chromatographic procedures essentially as described by Culberson (1972).

When using TLC for analysis of lichen substances, low concentrations of the chemicals within the lichen thallus can often cause difficulties in interpretation. In *Physcia* and *Phaeophyscia* this seems especially to be a problem with regard to the terpenoid compounds. While some species (e.g., *Ph. decolor*) produce significant and easily detected amounts of zeorin or other terpenoids, other species are more difficult. Among the species reported in this paper as containing no lichen substances, virtually every one on occasion exhibited unidentifiable terpenoids, usually in very faint traces and usually non-repetitively. Under such circumstances it is difficult to be absolutely certain of the true origin of the substances and they therefore have not been reported.

## Key To The North American Members Of *Phaeophyscia* (and K- *Physciae*)

1. Lobes mostly 2-4 (-5.5) mm broad, flat to more often somewhat concave, especially near the upturned lobe

tips; thalli relatively large (up to 14 cm diameter), usually with numerous, long (often 2 mm or more) black rhizines on the lower surface and projecting outward and often upward from the margin; with or without soredia or isidia.................. *Phaeophyscia hispidula*

1. Lobes mostly less than 1.5 mm broad (rarely to 3 mm), more or less flat or occasionally somewhat concave; thalli relatively small (mostly less than 5 cm, rarely up to 10 cm), lower surface with few to many rhizines (mostly 1 mm or less, never over 2 mm) which are seldom conspicuous from above (exceptions: *Ph. pusilloides*, *Ph. kairamoi*)....................................... 2
   2. Thallus without soredia, isidia or lobules, primarily sexual (fertile) species.......................... 3
   2. Thallus bearing soredia, isidia or lobules, primarily asexual (sterile) species...................... 11
3. Lower surface dark brown to black, with fairly numerous black rhizines........................................ 4
3. Lower surface white to pale tan or very pale brown, with sparse concolorous rhizines..................... 9
   4. Apothecial margin and the tips or margins of lobes with small, pale (rarely darkening) cortical hairs (Note: all species of *Phaeophyscia* may have a "corona" of dark or black rhizines around the base of the apothecia; these should not be confused with the cortical hairs which occur on both the upper part as well as the lower parts of the exciple).......... ................................ *Phaeophyscia hirtella*
   4. Apothecial margins and lobe margins lacking small, pale cortical hairs................................. 5
5. Medulla pigmented red (skyrin)......................... 6
5. Medulla not pigmented, white.......................... 8
   6. Ascospores of the *Pachysporaria*-type, with rounded to elongate lumina and relatively thick walls (Figs. 9-13)...................... *Phaeophyscia endococcinodes*
   6. Ascospores of the *Physcia*-type, with angular to somewhat rounded (but generally broader than long) lumina and thinner side walls (Figs. 3-8)................. 7
7. Amphithecial cortex of smaller cells, 3-7 (-10) µm in diameter; lobes flat, ca. 1 mm broad, gray or gray-brown; on bark or on mosses over rock.................. ........................... *Phaeophyscia erythrocardia*
7. Amphithecial cortex of larger cells, 6-12 (-15) µm in diameter; lobes flat to weakly convex, mostly 0.5 mm broad or less, brown; on rock. *Phaeophyscia endococcina*
   8. Amphithecial cortex of smaller cells, 3-6 (-8) µm in diameter; lobes flat, mostly 0.5-1.5 mm broad (some

forms only ca. 0.2-0.3 mm), gray or gray-brown; on bark or mosses over rock, rarely on rock............................................. *Phaeophyscia ciliata*

8. Amphithecial cortex of larger cells, 6-10 (-12) µm in diameter; lobes flat to weakly convex, mostly 0.5 mm broad or less, brown; on rock... *Phaeophyscia decolor*

9. Thallus of numerous, crowded ("turf-like"), long and narrow, mostly ascending lobes; generally on soil or mosses in arctic or alpine localities................................................ *Phaeophyscia constipata*

9. Thallus prostrate and adnate; generally on bark, more southern............................................ 10

10. Lower cortex paraplectenchymatous; eastern, very....rare............................ *Phaeophyscia leana*

10. Lower cortex prosoplectenchymatous; western, rare.................................... *Physcia nepalensis*

11. Medulla pegmented bright red, K+ violet (skyrin).................................. *Phaeophyscia rubropulchra*

11. Medulla white........................................ 12

12. Thallus with many small, ± erect lobules, primarily on the lobe margins.......... *Phaeophyscia imbricata*

12. Thallus with soredia, isidioid soredia or isidia. 13

13. Thallus with small, pale (or occasionally darkening) cortical hairs, especially on young lobe tips, on apothecial margins or (in *Ph. kairamoi*) on the isidia or soredia............................................ 14

13. Thallus without cortical hairs..................... 16

14. Soralia marginal, with very granular isidioid soredia or isidia bearing sparse pale or darkening hairs ............................. *Phaeophyscia kairamoi*

14. Soralia marginal or terminal, the soredia more finely granular, not isidioid and lacking hairs...... 15

15. Soralia labriform, mostly terminal on somewhat upright lobes, occasionally also marginal *Phaeophyscia hirsuta*

15. Soralia marginal, not labriform, usually distinctly elongate.................... *Phaeophyscia cernohorskyi*

16. Lower surface dark brown to black throughout or at least in the older, central parts, sometimes very pale marginally; lower cortex paraplectenchymatous (see also *Ph. nigricans* below).................. 17

16. Lower surface white to tan or very pale brownish. 20

17. Thallus with darkened, marginal or occasionally laminal, strongly isidioid soredia or isidia; lobes narrow, mostly less than 0.5 mm broad; saxicolous.......................................... *Phaeophyscia sciastra*

17. Thallus with finely granular to weakly isidioid soredia; lobes mostly broader than 0.5 mm............... 18

18. Soralia capitate, primarily terminal on main lobes or on small lateral lobes, often appearing distinctly stipitate due to the ascending nature of the lobes.................... *Phaeophyscia pusilloides*
18. Soralia marginal, laminal or terminal, but not strongly capitate or stipitate.................. 19
19. Soralia primarily laminal and submarginal, the soredia mostly finely granular....... *Phaeophyscia orbicularis*
19. Soralia primarily terminal and marginal, the soredia coarsely granular to isidioid.. *Phaeophyscia adiastola*
20. Lobes very narrow and linear, mostly less than 0.4 mm broad, with sparse granular soredia or isidia on some lobe tips or margins; lower cortex paraplectenchymatous................. *Phaeophyscia nigricans*
20. Lobes broader, mostly over 0.4 mm broad, with discrete laminal, marginal or terminal soralia; lower cortex prosoplectenchymatous.................... 21
21. Soralia marginal or terminal, distinctly labriform.... .................................. *Physcia luganensis*
21. Soralia primarily laminal or submarginal, rounded to irregular in shape................. *Physcia melanchra*

*PHAEOPHYSCIA ADIASTOLA* (Essl.) Essl., comb. nov.
Basionym: *Physcia adiastola* Essl, Mycotaxon 5: 299. 1977.

Until recently (Esslinger, 1977) this species was confused with *Ph. orbicularis* from which it differs by the larger and more granular (mostly 60-90 µm in diameter) soredia which are located in irregular, marginal or terminal soralia. In *Ph. orbicularis* the soredia are mostly 40-60 µm in diameter and are located in punctiform to irregular, laminal and submarginal soralia. *Phaeophyscia adiastola* is largely eastern (west to South Dakota) and *Ph. orbicularis* is largely western (east to Minnesota). The ascospores of *Ph. adiastola* are of the *Physcia*-type [(15-)17-23(-25) x 6-9.5 µm]. Another similar species is *Ph. rubropulchra* which can easily be distinguished by the red medulla (skyrin) and the larger spores of the *Pachysporaria*-type. *Phaeophyscia adiastola* is most common on mosses over rock, but grows also directly on rock or bark. See Esslinger (1977) for further discussion of these three species.

Chemistry: All spot tests negative. No substances detected by TLC.

No specimens will be cited; see the distribution map accompanying the protologue.

*PHAEOPHYSCIA CERNOHORSKYI* (Nádv.) Essl., comb. nov.

Basionym: *Physcia cernohorskyi* Nádv., Stud. Bot. Čech. 8: 98. 1947. Type: Czechoslovakia: in colle Velka hora prope pag. Karluv Tyn (=Karlstejn), calcicola, 350 m., *Černohorský*, 2.7.1941 (BRA, lectotype, selected here).

Synonym: *Physcia strigosa* Poelt et Buschardt in Poelt, Portug. Acta Biol. (B)12: 195. 1973. Type: Austria: Südtirol, Vinschgau, Laatsch, ca. 1100 m., *Buschardt 756* (GZU).

In North America this taxon has long been included (along with several others) in the concept of *Ph. orbicularis*; Thomson (1963) recognized it as the f. *albociliata* of that species. *Phaeophyscia cernohorskyi* differs from *Ph. orbicularis* in several characters, however. Except in highly eroded or mistreated specimens, small hyaline or pale (rarely darkening) cortical hairs can readily be seen on the upper surface of the lobe ends and (when fertile) on the apothecial margins. The soralia are mostly marginal, varying from short to often more or less linear. Laminal soralia are sometimes present also, although fewer in numbber. In most specimens the upper surface is distinctly maculate (white spotted), especially inward. *Phaeophyscia orbicularis*, on the other hand, is mostly emaculate, lacks cortical hairs, and has laminal to submarginal soralia.

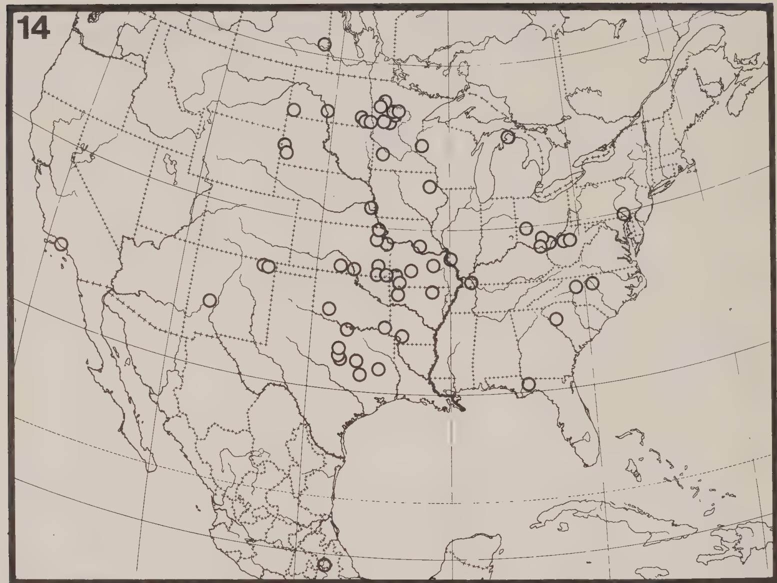
Cortical hairs like those of *Ph. cernohorskyi* occur in three other North American species (*Ph. hirsuta, Ph. hirtella, Ph. kairamoi*). They occur on the lobe ends (in all four species but less numerous in *Ph. kairamoi*), on the apothecial margin (in all four species), and on the isidia (of *Ph. kairamoi* only). When on the apothecial margin, they occur over its entire surface, particularly the upper part, however, and they should therefore not be confused with the rhizines which may ring the base of the apothecia in all species of *Phaeophyscia* (not all specimens of a given species have sucha a "corona" of rhizines on the apothecia, but many or most do). Although the degree of development of the cortical hairs in these species is variable (e.g. see *Ph. hirsuta*), they appear to be good characters for delimitation of species. In most cases, additional correlative characters are found separating them from similar "hairless" species.

The cortical hairs and mostly linear marginal soralia are diagnostic for *Ph. cernohorskyi*. If one overlooks the soredia (because of erosion, etc.) this species, especially when fertile, might easily be mistaken for *Ph. hirtella*, the fertile, nonsorediate counterpart. Like that species, the ascospores of *Ph. cernohorskyi* are of the *Physcia*-type [(15-)20-25 x 7-11(-14) µm]. Another closely related species is the much rarer (in North America) *Ph. hirsuta* which has similar cortical hairs but mostly terminal, labriform soralia and emaculate lobes. *Phaeophyscia kairamoi* also has cortical hairs and marginal soralia, but the soredia are more granular to strongly isidioid (see discussion of isidia under *Ph. sciastra*) and they bear the same small cortical hairs that are present on the lobe ends.

This species is widespread in North America. The map (Fig. 14) shows the distribution based on all specimens in US DUKE, FH, and my personal herbarium. Relatively few specimens of *Phaeophyscia* were seen from western North America (particularly from the Southwest) and this species may well prove to be more widespread there than indicated by the map.

The correct name to be used for this taxon has been in doubt. Poelt (1957), based on material sent to him by Nádvornik (Poelt, pers. comm.), interpreted *Ph. cernohorskyi* as having labriform soralia and he therefore treated it as a synonym of *Ph. hirsuta*. Later (Poelt, 1973), he and Buschardt described *Ph. strigosa* to accommodate the taxon with marginal, non-labriform soralia. However, the specimens in Nádvornik's herbarium at Bratislava (BRA) do not support this treatment. Thanks to the kindness of Dr. Ivan Pišút, the Curator at Bratislava, I have had the opportunity to study all specimens of *Ph. cernohorskyi* presently in the Nádvornik herbarium. Of the eleven specimens present, only five are from among those cited by Nádvornik in the protologue (syntypes) and it is from these that a lectotype must be selected. Although several of these are so fragmentary that any positive determination is difficult, all five (and especially the three good, intact specimens) have marginal or laminal, short to more or less linear (non-labriform!) soralia. It is therefore not possible to consider *Ph. cernohorskyi* to be a synonym of *Ph. hirsuta;* the name *Ph. cernohorskyi* takes priority over *Ph. strigosa* as the correct name for this taxon.

The specimen selected as a lectotype is one of the better developed of the five available syntypes. It is also the only specimen of the entire eleven examined (from Nádvornik's herbarium) that is marked, in Nádvornik's hand, "spec. orig.," and it therefore seems the most appropriate choice. It consists of three or four small, partly overlapping thalli in the center of a small piece of rock. All lobes are distinctly appressed and the soralia are laminal



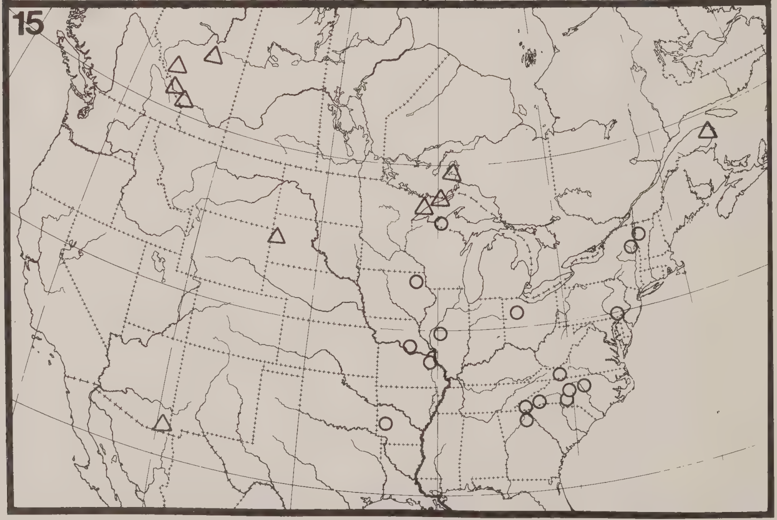


Figure 14. North American distribution of *Phaeophyscia cernohorskyi*.

Figure 15. North American distribution of *Phaeophyscia imbricata* (○) and *Phaeophyscia kairamoi* (△).

or largely marginal, punctiform to elongate, but definitely not labriform as in true *Ph. hirsuta*. The upper surface of the specimen is darker than usual, including the somewhat darkened cartical hairs, and the characteristic maculation is therefore more obscure than normal. This collection also has several thalli of *Ph. orbicularis* around and partly intermixed with the *Ph. cernohorskyi* but the protologue makes it clear to which material Nádvornik referred the name.

Chemistry: All spot tests negative. No substances detected by TLC.

No further specimens will be cited; see the distribution map (Fig. 14).

*PHAEOPHYSCIA CILIATA* (Hoffm.) Moberg, 1977: 30.

Basionym: *Lichen ciliatus* Hoffm., Enumeration Lichenum: 69. 1784.

This is one of the more common members of the genus *Phaeophyscia* in North America. The relatively small thalli (usually less than 4 cm) with narrow lobes [(0.2-) 0.5-1.5(-2) mm broad], the dark or black lower surface, the white medulla, and the lack of cortical hairs or asexual propagula will distinguish this from all other taxa included in this paper. *Phaeophyscia hirtella* (q.v.) is similar but differs by the presence of cortical hairs on lobe tips and apothecial margins, and in the generally maculate upper surface. While *Ph. ciliata* generally occurs on bark or on mosses over rock, related *Ph. decolor* is saxicolous and generally smaller (see discussion under that species). Some forms of *Physciopsis syncolla* (Tuck.) Poelt can appear very similar to *Phaeophyscia ciliata* but that species is much more closely appressed to the bark substrate (often difficult to remove for purposes of examining the lower surface), the lower surface is tan to blackening, and rhizines are few and poorly developed (virtually absent). All members of the genus *Physciopsis* have filiform conidia 10 µm or more in length, contrasting with the ellipsoid to fusiform conidia (4 µm or less) *of Phaeophyscia* species. The ascospores of *Ph. ciliata* are of the *Physcia*-type [(15-)17-22(-24) x 7-10 µm].

Chemistry: All spot tests negative. No substances detected by TLC (or, very rarely, a slight trace of zeorin).

Representative specimens: Arkansas. Montgomery Co.: Black Springs, *Hale 3905* (US). California. Mariposa Co.: Yosemite Valley, *Bolander*, 1867 (FH). Florida. Walton Co.: Glendale, *Moore 4859* (DUKE). Iowa. Fayette Co.: Echo Valley State Park, *Wetmore 13642* (DUKE). Kansas.

Leavenworth Co.: County Park, *Hale 4574* (US). Kentucky. Mason Co.: 7 mi. E of Germantown, *Culberson 655* (DUKE). Louisiana, *Hale*, 1851 (FH). Maine. Aroostook Co.: Portage, *Riddle*, 1907 (FH). Massachusetts. Berkshire Co.: Lanesboro, *Riddle*, 1910 (FH). Minnesota. Otter Tail Co.: Maplewood State Park, *Esslinger 5129* (herb. Esslinger). Mississippi. Jones Co.: Indian Springs, *Sierk 1083* (US). Missouri. Cooper Co.: 2 mi. NE of Clifton City, *Shoop 429* (US). New Hampshire. Grafton Co.: Warren, *Riddle*, 1906 (FH). New Mexico, Santa Fe Canyon, *Arsène 20520* (US, FH). New York, *Peck*, 1868 (FH). North Carolina. Brunswick Co.: 3.5 mi. NW of Dulah, *Esslinger 2838* (herb. Esslinger). North Dakota. Richland Co.: 5.5 mi. E of Mcleod, *Esslinger 4909A* (herb. Esslinger). Ohio. Franklin Co.: Columbus, *Bogue*, 1893 (US, FH, DUKE). South Carolina. Chester Co.: Chester, *Green*, 1898 (DUKE, US, FH). Tennessee. Hamilton Co.: Chattanooga, *Calkins 304* (US). Texas. Johnson Co.: Cleburne State Park, *Sierk 2063* (DUKE). Utah. Wasatch Co.: 10.4 mi. E of Springville, *Wetmore 16540* (DUKE). Vermont. Chittenden Co.: Charlotte, *Riddle*, 1908 (FH). Virginia. Greensville Co.: 5 mi. E of Emporia, *Luttrell & Allman 1615* (US). Wisconsin. Dane Co.: Albion, *Greene*, 1863 (FH).

*PHAEOPHYSCIA CONSTIPATA* (Norrl. et Nyl.) Moberg, 1977: 33.
Basionym: *Physcia constipata* Norrl. et Nyl., Herb. Lich. Fenn. Exs. 218. 1882 (Not seen). [As nom. nov. for *Physcia ulothrix * subciliaris* Nyl. in Norrl., Medd. Soc. F. Fl. Fenn. 1: 20. 1876 (Not seen).]

This species is one of a small number of North American *Phaeophyscia* species that have a pale lower surface (although still paraplectenchymatous). The numerous, usually much divided ascending lobes [0.5-1 (-2) mm broad] and the habitat (on soil or on mosses over rock) will distinguish it from *Ph. leana* and *Ph. nigricans*, the other species with pale lower surfaces. The lobes are relatively thick (up to 300 µm) and the narrower more divided segments may appear almost terete (though irregular) and thus subfruticose. The lower surface bears sparse, mostly marginal, pale to darkening rhizines ("cilia") and often bears low warts containing algae like those under the upper cortex. American specimens particularly (but also some European ones), sometimes have a pale yellow to yellowish-orange pigment scattered on some parts of the lower surface and on rhizines. The pigment is K+ violet and apparently is an anthraquinone but is present in such low concentrations that chromatographic identification proved impossible. The presence of such a pigment is interesting, however, because it supports inclusion of this and other species with pale lower surfaces in *Phaeophyscia*. Apothecia were not seen.

Although unlikely to be mistaken for other *Phaeophysciae*, this species has in the past been confused with members of the genus *Anaptychia*, particularly *A. bryorum* Poelt (Poelt, 1971). Although superficially similar, *A. bryorum* can be distinguished from *Ph. constipata* by its prosoplectenchymatous upper cortex.

Chemistry: All spot tests negative (except when the pigment described above is present on the lower surface). No substances detected by TLC (but see above).

Representative specimens: Colorado. Jefferson Co.: between Plainview & Eldorado Springs, *Weber & Anderson*, L-36338 (DUKE); Boulder Co.: 2 mi. W of Boulder, *Weber*, S4727A (DUKE). Alberta: 1.5 mi. above Fort Saskatchewan, *Turner*, 1958 (DUKE); 1.5 mi. W of Fort Saskatchewan, *Turner 10251* (DUKE).

*PHAEOPHYSCIA DECOLOR* (Kashiwadani) Essl., comb. nov.

Basionym: *Physcia decolor* Kashiwadani, Ginkgoana 3: 42. 1975.

The existence of two similar saxicolous taxa, one with a white medulla (*Ph. decolor*) and one with a red medulla (*Ph. endococcina*) has been recognized for quite some time but general agreement has not been reached regarding the appropriate status at which they should be recognized. The two most recent authors have taken opposite viewpoints. While Kashiwadani (1975) recognized the two as distinct species, Moberg (1977) concluded the two were undeserving of any taxonomic recognition whatsoever. Moberg based his opinion on the lack of any correlative morphological characters and the fact that, in his view, some thalli had a red medulla (i.e., contained skyrin) in one part but lacked it in another part. I have had the opportunity to examine only a small number of specimens of the two species and will therefore reserve final judgement until more specimens are available. For the time being I choose to recognize the two as distinct species, for the following reasons. In all other *Phaeophysciae* with which I am familiar, the presence or absence of skyrin in the medulla is a significant species character (although concentrations do vary at times, especially in the lobe ends). Also, from personal experience I know that the intricate intermixtures of two or more species that often occur in this genus can easily cause confusion regarding variability and delimitation of a species.

*Phaeophyscia decolor* is uncommon in North America but can be distinguished from other North American *Phaeophysciae* by the narrow lobes (mostly 0.2-0.5 mm broad, but up to 1 mm), dark color (gray-brown to dark brown, often with a scattered necrotic pruina), and saxicolous habitat. Occasional specimens of *Ph. sciastra* with sparse or no isidia appear very similar but can be distinguished by their lack of zeorin in TLC tests. The two sometimes grow together and must be carefully separated for TLC analysis. Infrequent darkened and saxicolous specimens of *Ph. ciliata* can appear very similar but that species also lacks significant quantities of zeorin. The character of the cells in the amphithecial cortex will also distinguish *Ph. decolor* and *Ph. ciliata* (see the key), but that character is notoriously difficult to use. The ascospores of *Physcia decolor* are of the *Physcia*-type [(15-)17-23(-27) x 8-10.5 µm] (Fig. 3).

Chemistry: All spot tests negative. Zeorin by TLC.

Specimens examined: California. Mariposa Co.: Yosemite National Park, *Hale 50088* (US). Colorado. Boulder Co.: 1 mi. NE of Gold Hill along Lefthand Creek, *Wetmore 16093* (US); Montrose Co.: W end of Paradox Valley, below Buckeye Reservoir, *Weber et al.*, L31312 (DUKE). Idaho. Blaine Co.: Wood River Campground, Sawtooth Rec. Area, *Hale 50092* (US). Montana. Lincoln Co.: 6 mi. E of Troy, *Hale 48159* (US), Pete Creek Campground, Yaak River Road, *Hale 48637* (US); Missoula Co.: 2 mi. SW of Lee Creek Campground after leaving Lolo Hot Springs, *Hale 49997* (US). Washington. Spokane Co.: Dishman Hills, *Esslinger 5216* (herb. Esslinger).

*PHAEOPHYSCIA ENDOCOCCINA* (Korb.) Moberg, 1977: 35.

Basionym: *Parmelia endococcina* Korb., Parerga Lichenologica: 36. 1865.

This saxicolous species is very close to *Ph. decolor*, differing primarily by the presence of skyrin in the medulla (see discussion under that species). Other similar North American species are *Ph. endococcinodes* with *Pachysporaria*-type spores and *Ph. erythrocardia* with broader lobed, paler thalli and with the cells of the amphithecial cortex smaller (see the key). The ascospores of *Ph. endococcina* are of the *Physcia*-type [17-22 x 8-11.5 µm]. According to Thomson (1963) the form with the colored medulla (*Ph. endococcina*) is less common in North America than the form with the white medulla (*Ph. decolor*). I have as of yet seen no authentic North American specimens of this species, but only misidentified specimens of *Ph. endococc-*

*inodes*. The non-North American specimens examined are therefore the only ones cited.

Chemistry: Medulla K+ purple. Skyrin and zeorin by TLC.

Specimens examined: Austria. Steiermark: Niedere Tauern, Donnersbachwald bei der Morsbachhütte, *Putzler*, 1954 (DUKE), *Klement*, 1954 (DUKE). Czechoslovakia. Bohemoslovakia: Tatra Minor, Latiborská hola, in valle Biela voda, *Vězda*, 1966 (DUKE). Rumania. Transylvania: infra montem Retyezát, *Lojka*, 1872 (DUKE). Sweden. Värmland: Rämen, *Lagergren*, 1868 (DUKE).

*PHAEOPHYSCIA ENDOCOCCINODES* (Poelt) Essl., comb. nov.

Basionym: *Physcia endococcinodes* Poelt, Khumbu Himal 6: 77. 1974. Type: Khumbu-Gebiet, Pheriche, ± 4250 m, *Poelt L385* (M, holotype).

This saxicolous species, only recently described by Poelt (1974), was previously included in the concept of *Ph. endococcina*. The two are very similar in most respects, the most distinctive difference being the *Pachysporaria*-type spores of *Ph. endococcinodes* [18-24(-27) x 9-12 μm in North American material, up to 32 μm long in some others] against the *Physcia*-type spores of *Ph. endococcina*. Other differences occur but are less absolute. Apothecia of both species may be crenate to lobulate but the lobules are more often strongly developed in *Ph. endococcinodes*. Also, although the anthraquinone skyrin is common to both, the zeorin found consistently in *Ph. endococcina* is absent or present in only trace amounts in *Ph. endococcinodes*.

This species seems to have a south temperate-tropical montane distribution, and is known in North America from as far north as Arizona. The species was previously reported only from the Himalyas and so non-North American material is cited below also.

Chemistry: Medulla K+ purple. Skyrin and sometimes also a trace of zeorin by TLC.

Representative specimens: Arizona. Cochise Co.: Chiricahua Mtns., *Nash 7020* (DUKE). Hawaii. Maui Co.: crater of Haleakala, *Forbes 1308m* (herb. Esslinger). Mexico. Morelos: near Cuernavaca, *Pringle 15380, 15387* (FH). Panama. Prov. Chiriqui: Volcan Chiriqui, *Esslinger 4525* (herb. Esslinger). Colombia: Bogota, *Lindig 2936* (FH). China. Fukien Prov.: Kushan near Foochow, *Chung F259* (FH). India. Tamil Nadu: Kodaikanal, Palni Hills, *Hale 43879* (US). Japan. Prov. Musashi: Mt. Ryogami, *Suzuki 294* (TNS), Mt. Buko, *Asahina 30, 169* (TNS), Mt. Takao, *Hashimoto*, 1932 (TNS). Sabah: Kinabalu National Park, along Mesilau Trail, *Hale 28297* (US), near R. S. campsite, E. Mesilau River, *Hale 28446* (US). Rumania. Transylvania: com. Hunyas, infra alpem Retyezát, *Lojka*, 1872 (DUKE).

*PHAEOPHYSCIA ERYTHROCARDIA* (Tuck.) Essl., comb. nov.
Basionym: *Physcia obscura* var. *erythrocardia* Tuck., Proc. Amer. Acad. Arts Sci. 4: 399. 1860.
Synonym: *Physcia erythrocardia* (Tuck.) Kashiwadani, Ginkgoana 3: 44. 1975.

This taxon is closely related to *Ph. ciliata*, differing primarily by the presence of skyrin and zeorin in the medulla. It would be most likely to be confused with *Ph. endococcinodes* or *Ph. endococcina*, two saxicolous species with similarly red pigmented medullas. Both are darker and generally narrower lobed. The cells of the amphithecial cortex in *Ph. erythrocardia* are smaller (mostly 3-7 µm) than those of *Ph. endococcina* and *Ph. endococcinodes* (mostly 6-12 µm). Also the spores of *Ph. endococcinodes* are *Pachysporaria*-type while those of *Ph. erythrocardia* are *Physcia*-type [20-25(-28) x 9.5-12(-13) µm] (Fig. 4).

Chemistry: Medulla K+ purple. Skyrin and zeorin by TLC.

Specimens examined: Minnesota. Koochiching Co.: Rainy Lake City, along or near the International Boundary, *Fink*, 1901 (DUKE, FH). Mexico. Federal Dist.: La Cima, *Pringle 10718* (US, FH).

*PHAEOPHYSCIA HIRSUTA* (Meresch.) Essl., comb. nov.
Basionym: *Physcia hirsuta* Meresch., Ann. Conserv. Jard. Bot. Genève 21: 181. 1919. Type: Switzerland. Ticino: Lugano, *Mereschkowsky*, 1919 (US, FH, syntypes).
Synonym: *Physcia labrata* Meresch., Ann. Conserv. Jard. Bot. Genève 21: 183. 1919. Type: Switzerland. Ticino: Lugano, *Mereschkowsky*, 1919 (US, FH, syntypes).

*Phaeophyscia hirsuta* is one of the less common members of this genus in North America although undoubtedly more widespread, especially in the Southwest, than the few collections cited below would indicate. It is a small and easily overlooked species. The diagnostic features are the pale cortical hairs and the terminal, labriform soralia. The thallus often consists of numerous, more or less separate ascending lobes bearing labriform soralia and cortical hairs. At other times a more rosette-form thallus is produced. The species most likely to be confused with *Ph. hirsuta* is *Ph. cernohorskyi* which differs, however, in having laminal and marginal, often linear soralia. Also the distinct maculation on the upper surface of *Ph. cernohorskyi* is absent in the often slightly darker *Ph. hirsuta*. The ascospores of *Ph. hirsuta* are *Physcia*-type [(16.5-)18-22.5 x 6-9.5 µm] although the spore lumina in some specimens (e.g., the North Dakota specimens) become more elongate and rounded than usual.

Of the species of *Phaeophyscia* with cortical hairs, *Ph. hirsuta* seems the most variable with regard to their production. They were found to be sparse in several of the North American specimens cited below (present only on a few lobes), and missing entirely in one (*Standley 14762*). The type material of *Ph. labrata* Meresch. (cited above) consists partly of such "hairless" *Ph. hirsuta* also (Moberg, 1975). It may be significant that all specimens with few or no hairs seen by me were old and rather scrappy . The cortical hairs are delicate and their absence (or rarity) in such specimens might be partially explained by mistreatment or abrasion.

Occasional specimens of *Ph. hirsuta* are largely pale on the lower surface, darkening only here or there in older parts of the thallus. Such specimens can easily be confused with *Physcia luganensis* (q.v.), especially if the cortical hairs are overlooked or missing as described above.

Chemistry: All spot tests negative. Occasional trace of zeorin by TLC.

Specimens examined: California. Los Angeles Co.: San Gabriel Mts., Eaton Canyon, *Moxley 635* (FH). Colorado. El Paso Co.: Palmer Lake, *Laidig 8* (FH). New Mexico. Colfax Co.: vicinity of Ute Park, *Standley 14762* (FH). North Dakota. Burleigh Co.: ca. 13 mi. SW of Bismarck, *Esslinger 5580, 5582* (herb. Esslinger); Dunn Co.: Little Missoure State Primitive Park, *Esslinger 5869* (herb. Esslinger); Slope Co.: 6.5 mi. N and 9 mi. W of Amidon, *Esslinger 5710* (herb. Esslinger). Texas, *Wright s.n.* (FH). Mexico. Coahuila: 27 km below Piedras Negras on the Monterey Hwy., *Bell*, 1965 (DUKE); Jalisco: 12 km from Zapotlanejo, *Bell*, 1965 (DUKE).

*PHAEOPHYSCIA HIRTELLA* Essl., sp. nov. Fig. 16

*Phaeophyscia ciliata* subsimulans sed loborum apicem versus et ad marginem apotheciorum pilis minutis erectisque albicantibus obtecta.

Type: Minnesota. Clearwater Co.: Itasca State Park, Univ. of Minnesota Biological Station, along Professor Green Trail, *Hale 23423* (DUKE, holotype).

Thallus greenish gray to darker gray or occasionally somewhat brownish, 1-3(-4) cm in diameter, generally more or less orbicular. Lobes dichotomously or irregularly branched, irregularly rounded to more or less linear, usually flat, (0.3-)0.5-1(-1.5) mm broad, with sparse to numerous, pale or almost hyaline cortical hairs, especially on the lobe ends and/or margins, the upper surface often distinctly white maculate. Without soredia or isidia. Lower surface black, sometimes paler on the lobe-ends, with rather numerous black rhizines, mostly ca. 0.5 mm in length. Apothecia numerous, mostly 0.8-1.5(-3) mm in diameter, often with darkened rhizines around the base, the upper part of the exciple bearing pale (or rarely somewhat darkened) cortical hairs 50-200(-350) µm in length (like those on the lobe tips); ascospores 18-22.5 x 8-10 µm, of the *Physcia*-type. Both the upper and lower cortices are paraplectenchymatous and leptodermatous; medulla white.

Thomson (1963) recognized this taxon as a minor variant of *Ph. ciliata* (f. *fibrillosa* Thoms.). The two species are closely related and, since they often grow intermixed on the same branch, can be easily confused. However, here as elsewhere in *Phaeophyscia*, the presence or absence of cortical hairs is generally correlated with other characters, and seems to be a good species character. *Phaeophyscia ciliata* differs from *Ph. hirtella* in lacking the cortical hairs and the maculations on the upper surface, and in its broader distribution. Like *Ph. ciliata*, *Ph. hirtella* is primarily a corticolous species.

Another species that might be confused with *Ph. hirtella* is the Asian species, *Phaeophyscia hirtuosa* (Krempelh.) Essl.* The latter species also bears hyaline or darkening hairs on the apothecia although these usually average longer (often 200-300 or up to 500 µm in length) and coarser than those of *Ph. hirtella*. Also, *Ph. hirtuosa* lacks cortical hairs on the lobe ends. In general, *Ph. hirtuosa* is a larger, coarser species (thallus size up to 6 or 7 cm, lobe width generally 1-3 mm, apothecia commonly to 3 or 4 mm across), more closely resembling *Ph. hispidula* than *Ph. hirtella* or *Ph. ciliata*.

Chemistry: All spot tests negative. No substances detected by TLC.

Representative specimens: Arkansas. Crittenden Co.:

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* *Phaeophyscia hirtuosa* (Krempelh.) Essl., comb. nov. Basionym: *Physcia hirtuosa* Krempelh., Flora 56: 470. 1873. Type: China. Shanghay u. Wampoa, *Rabenhorst*, 1871 (FH, isotype).

(16)

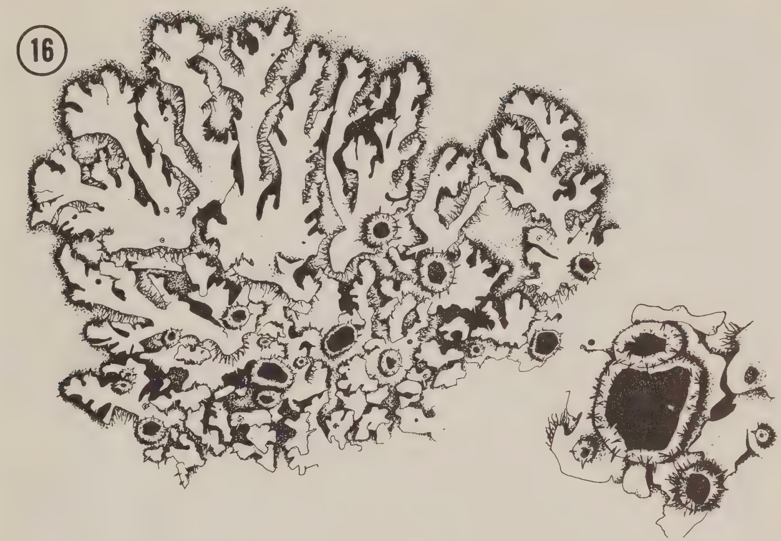


Figure 16. Drawing of a portion of a thallus of *Phaeophyscia hirtella* (X 5) and a closeup (insert) of several apothecia (X 13); *Johnson 53* (herb. Esslinger). Drawing by Laurie Friese.

no locality, *Peters*, 1878 (FH). Maryland. Anne Arundel Co.: Robinson's Forest Home, *Plitt 74* (US, FH). Minnesota. Otter Tail Co.: Maplewood State Park, *Esslinger 5139* (herb. Esslinger). New Mexico. Colfax Co.: vicinity of Ute Park, *Standley 13508* (FH). North Dakota. Ransom Co.: ca. 4 mi. WSW of McLeod, *Esslinger 4916* (herb. Esslinger); Richland Co.: ca. 18.5 mi. N of Wyndmere, *Esslinger 4881* (herb. Esslinger). Ohio. Cuyahoga Co.: Cleveland, *Lea*, 1850 (FH). Oklahoma. Bryon Co.: 1.5 mi. N of Lake West, *Keck 1473* (US); Noble Co.: 10 mi. SE of Perry, *Adams 28* (US). Tennessee. Rutherford Co.: NE of Rockvale, *Pursell 3461* (US). Texas, no locality, *Wright*, 1850 (FH). Vermont. Addison Co.: Bristol, *Riddle*, 1908 (FH). Virginia. Giles Co.: below Mountain Lake, *Culberson 11286* (DUKE). Wisconsin. Douglas Co.: 11.5 mi. N of Dairyland, *Schroeder & Schroeder L459* (herb. Esslinger). Canada. Ontario: London, *A.T.D. 41* (FH).

*PHAEOPHYSCIA HISPIDULA* (Ach.) Essl., comb. nov.
Basionym: *Parmelia hispidula* Ach., Lichenographia Universalis: 468. 1810.

The variability of this taxon is still under study. There appear to be at least two distinct species involved here but the nomenclature is unsettled. It is uncertain to which of the two species the name *Ph. hispidula* will accurately be applied. For the time being, only one species will be recognized, as has been the practice in the past.

The members of this complex are distinguished from the *Ph. orbicularis* group largely on the basis of size. *Phaeophyscia hispidula* (sensu lato) has moderately large thalli (up to 14 cm in diameter, commonly 4-8 cm) with lobes from 1 to 4 (rarely to 6) mm broad. Other North American *Phaeophysciae* generally have smaller thalli (usually 5 cm or less in diameter, very rarely up to 10 cm) and lobes averaging less than 2 mm broad (generally ca. 1 mm or less, rarely up to 3 mm). Thalli of *Ph. hispidula* are seldom regularly rosette forming as are many (but not all!) other *Phaeophysciae*, and the irregularly branched lobes have a very distinctive appearance. Almost without exception they are somewhat concave, especially at the lobe ends (due to upturned tips), and specimens with elongate lobes may be decidedly channeled. The rhizines are mostly simple as in other *Phaeophysciae* but are generally longer and more dense than in most other species. The long black rhizines (always with some that exceed 1 mm in length, with 2-3 mm being common and up to 5 mm long not rare) are often conspicuous from above, especially at the lobe ends where they project outward and often (a few) upward. The longer rhizines are sometimes distinctly flexuose. Apothecia are rare north of Mexico; ascospores are of the *Physcia*-type [20-25 (-27) x 10-14 µm].

Poelt (1974) recognized four taxa in this complex, all at the level of subspecies, and delimited approximately as follows:

-without isidia or soredia: *Physcia hispidula* ssp. *primaria* Poelt
-with marginal granular soredia: *Physcia hispidula* ssp. *limbata* Poelt
-with marginal isidia: *Physcia hispidula* ssp. *exornatula* (Zahlbr.) Poelt.
-with submarginal capitate soralia: *Physcia hispidula* ssp. *hispidula*

As far as I can determine from his paper, Poelt did not examine the types of any of the previously described taxa involved and therefore did not settle the correct application of the name *Physcia hispidula* [or its supposed synonym *Physcia setosa* (Ach.) Nyl.].

The two taxa (seemingly good species) I recognize in this group correspond approximately to Poelt's ssp. *hispidula* and ssp. *limbata*. I believe that ssp. *primaria* and ssp. *exornatula* are only extremes of ssp. *limbata* (extremely sparsely sorediate in the first case and with extremely strongly isidioid soredia in the second case). In the United states, the taxon with marginal, granular or isidioid soredia (ssp. *limbata*) has a distinctly western distribution (see specimen citations below) and is primarily saxicolous (ca. 25 of 31 specimens). Contrastingly, the taxon with capitate soralia and more finely granular soredia tends to be eastern (see specimens cited below) and primarily corticolous (14 of 15 specimens). Both occur in Mexico and Central America. A similar trend regarding substrates can be seen between the two taxa outside of North America as well, although seemingly not so pronounced.

In North America, the species most likely to be conused with *Ph. hispidula* (sensu lato) are related *Ph. imbricata* and *Ph. kairamoi*. Both have generally smaller thallus dimensions, although they can overlap broadly in size with *Ph. hispidula*. *Phaeophyscia imbricata* differs by possession of numerous, usually erect lobules along the lobe margins. These lobules, at their small extreme, may be somewhat granular, resembling isidioid soredia of *Ph. hispidula*, but thalli with such small granular lobules generally also have larger, more distinctive lobules in some parts. *Phaeophyscia kairamoi* has strongly isidioid soredia not unlike those of *Ph. hispidula* (ssp. *limbata*) but they bear (as also do some lobe tips) small, pale or darkening cortical hairs. The strongly isidioid soredia of *Ph. hispidula* sometimes bear sparse, small black rhizines. The occasional smaller-than-average specimens of *Ph. hispidula* might be mistaken for a number of the other sorediate *Phaeophysciae* and must be distinguished by the irregular thallus, concave (upturned at tip) lobes and the outward and upward spreading rhizines.

Chemistry: All spot tests negative. No substances detected by TLC.

Representative specimens (ssp. *limbata*): Arizona. Cochise Co.: Chiricahua Mtns., Cave Creek Canyon, *Lich. Exs. Colo. No. 93* (US, DUKE); Pima Co.: Mt. Lemmon, *Culberson & Culberson 10565* (DUKE). Colorado. Jefferson Co.: Bull Gulch, between Plainview & Eldorado, *Weber & Anderson*, L36337 (US, DUKE, FH); Boulder Co.: Boulder Canyon just above Boulder Falls, *Weber & Shushan*, S2170 (FH). New Mexico. Rio Arriba Co.: vicinity of Brazos Canyon, *Standley & Bollman 11140* (US, FH); Santa Fe Co.: Santa Fe, *Reliquiae Tuckermanianae 71* (US, DUKE). South Dakota. Pennington Co.: 10 mi. NW of Rapid City, *Wetmore 8790* (DUKE), 13 mi. SW of Rapid City, *Anderson*, S20932 (US). Texas. Brewster Co.: Big Bend National Park, Casa Grande, *Wetmore 19518* (FH). Mexico. Chihuahua: San Pedro Springs, *Gooding*, 1907 (FH); Federal District: Cañada, *Pringle 15563* (FH); Michoacan: Patzcuaro, *Pringle 123* (FH), *257* (FH, DUKE); Sinaloa: in mtns. 109 km (by road) E of Mazatlán, *Culberson 13437, 13409* (DUKE); Veracruz: Teocello Canyon, just S of Xico & Jalapa, *Hale 21071* (DUKE); Puebla: Santa Barbara, *Nicolas 5755* (US).

Representative specimens (ssp. *hispidula*): Maine. Knox Co.: Warren, *Merrill, Lich. Exs. No. 65* (US, FH, DUKE). Michigan. Baraga Co.: Slate River Falls, *Imshaug 4679* (FH, US); Emmet Co.: Wilderness Park, *Hale 11245* (US). Minnesota. Koochiching Co.: Big Falls, *Hale 22273* (US); St. Louis Co.: near E end of Kabetogama Lake, *Williams*, 1977 (herb. Esslinger). New York. Essex Co.: Jay, *Riddle*, 1908 (FH). Ohio, no locality, *Lesquereax 246* (FH). Virinia. Lee Co.: E of Jonesville, *Hale 33334* (US). West Virginia. Greenbrier Co.: Neola, *Hale 18958* (US). Canada. Ontario: Ottawa, *Macoun 17* (FH), *96* (US). Mexico. Federal District: La Cima, *Pringle 10737* (DUKE, FH). Costa Rica. San Jose: between Empalma & Santa Maria, *Culberson 12446* (DUKE). Panama. Chiriqui: 1 km N of Las Nubes, *Almeda 998* (herb. Esslinger). Jamaica. Portland: ca. 1 mi. from Section, *Culberson & Culberson 13875* (DUKE).

*PHAEOPHYSCIA IMBRICATA* (Vain.) Essl., comb. nov.

Basionym: *Physcia imbricata* Vain., Bot. Mag. Tokyo 35: 60. 1921.

This species has previously been known in the North American literature as *Physcia lacinulata* Müll. Arg. The latter species is superficially very similar to *Ph. imbricata* but differs markedly in having atranorin in both the cortex and the medulla which are therefore strongly K+ yellow. In addition *Ph. lacinulata* differs in having a much paler (almost white) upper surface, a very pale tan lower surface with sparse rhizines, and ascospores of the *Pachysporaria*-type [20-24.5 x 9-11 µm] (Fig. 9). The North American (and Japanese) species, *Ph. imbricata*, lacks atranorin (K- cortex and medulla), has a dull gray to pale brownish (especially on lobe margins) upper surface, often with a light necrotic pruina, a lower surface that is typically dark brown to black except on lobe ends or margins (occasionally darkening only in smaller areas) and has numerous black rhizines, and ascospores of the *Physcia*-type [(18-)20-24(-27) x 9-11.5(-13.5) µm] (Figs. 5 & 6).

*Phaeophyscia imbricata* is a very distinctive species, being the only member of the genus with a regularly lobulate thallus and a white medulla. The lobules are primarily marginal and generally tend to be more or less erect. There is considerable variation in size among the lobules, which measure (50-)80-250(-500) µm in breadth and typically are longer than they are broad; they may be simple or branched. Some lobules at the low end of the size range resemble isidia and at their extreme may appear almost granular. Some obviously dorsiventral lobules are always present, however. Specimens with the larger lobules at times appear almost panniform. The lobules are obvious propagules and apothecia are infrequent (observed in 4 of 25 North American specimens and 2 of 6 Japanese specimens). Based on herbarium specimens annotated by J. W. Thomson, his *Physcia ciliata* f. *squamulosa* Thoms. is a synonym of *Ph. imbricata*, but I have not seen the type. The occasional weakly lobulate specimens of *Ph. ciliata* that are seen can be easily distinguished from *Ph. imbricata* by their lack of zeorin.

Thomson (1963) and Hale (1969) characterized this species (as *Physcia lacinulata*) as having a white lower surface. Although the type of *Ph. lacinulata* (see below) is distinctly white or pale tan on the lower surface, true *Ph. imbricata* is dark brown to black on most of the lower surface. A significant area on the lobe tips and margins may be very pale and rarely (only 2 of about 30 specimens examined) larger areas may be relatively pale. There are almost always some darkened areas, however, and the rather numerous black rhizines are characteristic of species that ususally have darkened lower surfaces. *Phaeophyscia imbricata* occurs most commonly on tree bases or over mosses on rock. In North America, it has a distinctly eastern distribution (Fig. 15).

The protologue of *Physcia lacinulata* Müll. Arg. (Soc. Royal de Bot. Belgique 30: 54. 1891) cites three syntypes. One of these (*Pittier 5065)* is not the same as the other two and in fact is a sorediate (not lobulate at all) specimen corresponding to "*Physcia albicans* (Pers.) Thoms." (=*Ph. crispa* Nyl.). The other two specimens are the same lobulate species and I have selected the more abundant one of these as lectotype [Costa Rica, Foret du Barba, *Pittier 5064* (G)]. The lower cortex of *Physcia lacinulata*, although pale, is paraplectenchymatous, a feature that would seem to relate it most closely to members of the *Physcia tribacia-tribacioides* group. Like some other members of that group, some lumina in the lower cortex seem to be weakly periclinally elongate, possibly indicating an obscure prosoplectenchyma rather than a true paraplectenchyma.

Chemistry: All spot tests negative. Zeorin and often traces of other unidentified terpenoids by TLC.

No specimens will be cited; see the distribution map (Fig. 15).

*PHAEOPHYSCIA KAIRAMOI* (Vain.) Moberg, 1977: 40.

Basionym: *Physcia kairamoi* Vain., Medd. Soc. F. Fl. Fenn. 46: 3. 1921.

Synonyms: *Physcia karakorina* Poelt, Mitt. Bot. Staatssamml. München 4: 92. 1961. Type: not seen.
*Physcia nadvornikii* Frey et Poelt, Ber. Schweiz. Bot. Ges. 73: 472. 1963 (as nom. nov. for *Ph. cernohorskyi* var. *erosa* Nádv., Studia Bot. Čech. 8: 99. 1947). Type: Austria. Tirol: am wege gegen dos Sellajoch bei Wolkenstein in Groeden, in *Arnold, Lich. Exs. No. 1649* (DUKE, isotype).

This species was first reported for North America by Moberg (1974). The synonymy seems to be largely a result of the broad distribution coupled with a low frequency of occurrence. *Phaeophyscia kairamoi* is a fairly distinctive species although it has seldom been recognized in the past. The diagnostic features are the dark marginal isidia which bear sparse, pale (or darkening) cortical hairs. Similar hairs are present on some lobe tips and, in some specimens, also on the apothecial margins. In older specimens some of the isidia become weakly lobulate and the pale hairs blacken, resembling short rhizines. Regarding size, North American specimens are average *Phaeophysciae* (thalli to 5 or 6 cm, lobes mostly 0.5-2 mm), although Moberg (1969) reported thalli up to 15 cm and lobes 1-4 mm broad for Scandinavian specimens. The irregular thalli with irregularly branched lobes and the upturned densely rhizinate lobes resemble *Ph. hispidula*; the larger specimens of *Ph. kairamoi* might be mistaken for that species. Apothecia are rather frequent for an isidiate species (absent in only one of the 10 North American specimens examined), the apothecia being up to 3 mm broad with the upper exciple naked or bearing sparse hairs. The ascospores are rather large [(22.5-)24-32(-34) x (8-)10-14 µm] and are distinctly *Physcia*-type although the lumina of some become more or less rounded with age.

Most specimens are from rock or soil or from mosses over rock. One specimen (*Esslinger 5394* from Minnesota) was collected from the base of a tree (*Thuja*) on a rocky slope and two Austrian specimens (cited below) from twigs were seen. In addition to the localities cited below and those North American localities plotted on the distribution map (Fig. 15), this species has previously been reported from Norway, Finland, Sweden, U.S.S.R., Austria, Italy, Kashmir, and Canada (Moberg, 1969, 1974).

Chemistry: All spot tests negative. No substances detected by TLC.

Representative specimens (see Fig. 15 for North American localities): Austria. Salzburg: Krimml, *Klement*, 1952 (DUKE); Tirol: am Stuibenfall bei Umhausen im Ötztal, *Lich. Alpium No. 173* (DUKE). U.S.S.R. Guv. Jenisejsk: Tjolkina, Jenisejsk, *Brenner 133d* (FH), Tschulkova, *Brenner 2584* (FH).

*PHAEOPHYSCIA LEANA* (Tuck.) Essl., comb. nov.

Basionym: *Parmelia leana* Tuck. in Lea, Cat. Plants Cincinnati: 45. 1849. Type: Ohio, *Lea*, 1848 (FH, holotype).

*Phaeophyscia leana* is characterized by the rather elongate, strap-shaped lobes, faintly maculate upper surface, lack of soredia, and the paraplectenchymatous, pale lower cortex. For years it has been known in North America only from the type collection, made from the trunk of a tree near Cincinnati, Ohio. The species has now also reportedly been collected in southern Illinois by Dr. A. Skorepa (in litt.).

Kashiwadani recently (1975) reported this species from Japan. The five Japanese specimens seen by me, however, differ from North American *Ph. leana* in several ways. First and most significantly, the five Japanese specimens all have relatively thick-walled spores of the *Pachysporaria*-type (Fig. 10) while those of *Ph. leana* are distinctly of the *Physcia*-type (Fig. 7). Spore size is virtually identical, 18-23 x 8-10.5 µm. In addition the type specimen of *Ph. leana* differs from the Japanese specimens by the following characters: it has longer, more distinctly strap-shaped lobes; the upper surface is lightly but distinctly maculate throughout; apothecia are short stipitate instead of sessile; excipular rhizines are very few rather than numerous, and the exciple is entire to weakly crenate but lacks the tiny, often downward pointed lobules seen on many of the Japanese specimens. Although the relative numbers of excipular rhizines vary greatly in most species of *Phaeophyscia*, the other characters outlined above indicate that the Japanese specimens represent a species distinct from (although similar to) *Ph. leana*. The appropriate name for the Japanese species would be *Phaeophyscia trichophora* (Hue) Essl., comb. nov. Basionym: *Physcia trichophora* Hue, Nouv. Arch. Mus. Hist. Nat. Paris, ser. 4, 2: 74. 1900.

Chemistry: All spot tests negative. No substances detected by TLC.

*PHAEOPHYSCIA NIGRICANS* (Flk.) Moberg, 1977: 42.

Basionym: *Lecanora nigricans* Flk., Deutsche Lichenen 91. 1819. Not seen.

*Phaeophyscia nigricans* is probably more common and widespread in North America than the specimens cited below would indicate. The small thalli (up to 1 or 2 cm but sometimes coalescing), narrow lobes (0.05-0.3 mm broad), and gray-brown coloration combine to make this specis almost invisible on the usual substrate (*Populus* or other angioserm bark, rarely rock). Specimens tend to be more or less rosette forming with lobes appressed or sometimes ascending at the ends. Granular, darkened isidia are generally present, borne on lobe tips or margins. The upper and lower cortices are paraplectenchymatous as in other *Phaeophysciae*, but the medulla of some specimens is partly hyphal and partly cellular, sometimes with normal paraplectenchyma and other times with swollen-celled moniliform hyphae. Apothecia are infrequent and small, with distinctive *Physcia*-type spores 16.5-20 x 7-10 µm.

Chemistry: All spot tests negative. No substances detected by TLC.

Specimens examined: Colorado. Boulder Co.: just S of Red Hill, between Altona and Lyons, *Shushan & Weber*, S3385 (FH). North Dakota. Dunn Co.: ca. 5.5 mi. N and 11.5 mi. W of Killdeer, *Esslinger 5759* (herb. Esslinger, US). Wyoming. Crook Co.: Lytle Creek E of Devils Tower National Monument, *Wetmore 11494* (DUKE).

*PHAEOPHYSCIA ORBICULARIS* (Neck.) Moberg, 1977: 44.

Basionym: *Lichen orbicularis* Neck., Delicae Gallo-Belgicae: 509. 1768.

The taxonomy and distribution of this species in North America were discussed by Esslinger (1977). The name *Ph. orbicularis* has been used in a very broad sense for many years to include such species as *Ph. adiastola*, *Ph. rubropulchra*, and *Ph. pusilloides*, among others. *Phaeophyscia orbicularis* is characterized by its laminal and submarginal, punctiform to irregular soralia and relatively fine granular soredia. The lower surface is almost always black but rarely is largely pale, darkening only in the older parts. Such specimens would have to be carefully distinguished from *Physcia melanchra* (q.v.) which also has a pale (but prosoplectenchymatous) lower cortex and laminal soralia. The ascospores of *Ph. orbicularis* are *Physcia*-type [(17-)

20-25(-28) x 8-11 µm].

Chemistry: All spot tests negative. No substances detected by TLC or, rarely, a slight trace of zeorin will be present; an unknown anthraquinone is occasionally present in the soralia, see Esslinger, 1977.

No specimens will be cited; see the distribution map in Esslinger (1977).

*PHAEOPHYSCIA PUSILLOIDES* (Zahlbr.) Essl., comb. nov.

Basionym: *Physcia pusilloides* Zahlbr., Cat. Lich. Univ. 7: 678. 1931 (as nom. nov. for *Ph. pusilla* Meresch., Ann. Conserv. Jard. Bot. Genève 21: 188. 1919). Type: Switzerland. Lugano, *Mereschkowsky*, 1919 (FH, syntype).

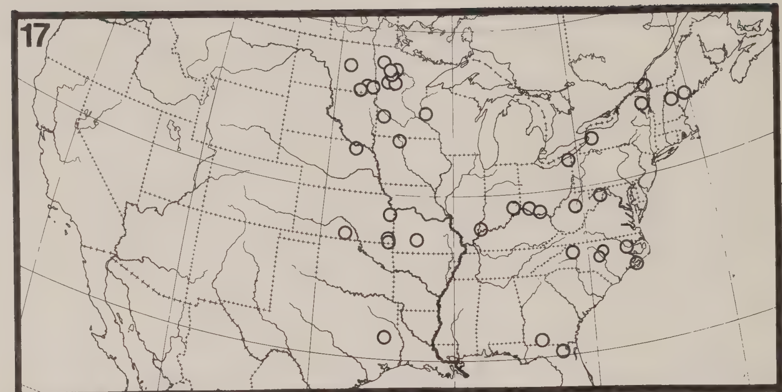
Although this taxon has been recognized in Europe by several authors (Mereschkowsky, 1919; Nádvornik, 1947; Frey, 1963), it was only recently reported for North America by Poelt (1971). The distinguishing characters are the distinctly globose (capitate) soralia (formed by the strongly reflexed lobe tip) found on the lobe ends or margins or on small lateral lobes, the dark rhizines which often project from the margin and are visible from above, and the narrow, more or less linear lobes. The soralia-bearing lobes are often more or less ascendent, giving the soralia a stipitate appearance. Occasionally the rhizines are not or only slightly visible from above. Even more rarely the lower surface of the lobe ends and the associated rhizines are pale (almost white), but they are always blackish inward. Young or incompletely developed soralia are often weakly to distinctly labriform. Occasionally the soredia of *Ph. pusilloides* become enlarged and granular isidioid [e.g., *Culberson 6388* (DUKE)] but are still distinctly clustered into capitate soralia. Apothecia are uncommon, the spores are of the *Physcia*-type [18-23(-25) x 7-10.5 µm] although the lumina of some round off with age. *Phaeophyscia pusilloides* is largely corticolous and has an eastern distribution in North America (Fig. 18).

Chemistry: All spot tests negative. No substances detected by TLC [A few specimens were seen in which the soralia and the medulla near the soralia contained a pale yellow pigment (K+ violet), probably an anthraquinone; it was present in amounts too small for TLC analysis].

No further specimens will be cited; see the distribution map (Fig. 18).

*PHAEOPHYSCIA RUBROPULCHRA* (Degel.) Essl., comb. nov.

Basionym: *Physcia orbicularis* f. *rubropulchra* Degel.,



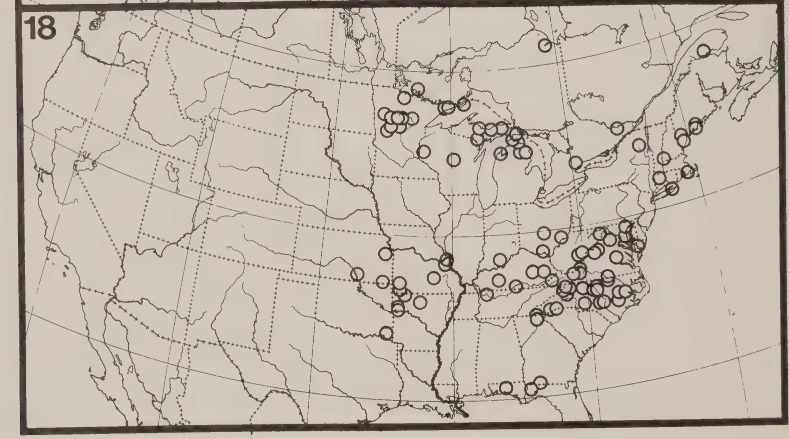


Figure 17. North American distribution of *Physcia luganensis*.
Figure 18. North American distribution of *Phaeophyscia pusilloides*.

Ark. Bot. 30A(1): 58. 1940.

Because of the red medulla this is one of the more easily recognized sorediate species of *Phaeophyscia* in North America. Although the concentration of skyrin in the medulla varies somewhat (and may be absent near the lobe tips), it can always be seen in the older thallus parts. Morphologically, this species most closely resembles *Ph. adiastola* which, however, lacks the skyrin and fatty acid characteristic of *Ph. rubropulchra*. Also, the ascospores of

*Ph. rubropulchra* are larger [(21-)24-31(-34) x (9-)10-14 (-16) µm] than those of *Ph. adiastola* (q.v.) and are of the *Pachysporaria*-type rather than the *Physcia*-type. *Phaeophyscia rubropulchra* is largely corticolous while *Ph. adiastola* is more frequent on mosses over rock (see Esslinger, 1977).

Chemistry: Medulla K+ purple. Skyrin and an unidentified fatty acid ($R_f$ classes A:2-3, B:1, C:1-2).

No specimens will be cited; see the distribution map in Esslinger (1977).

*PHAEOPHYSCIA SCIASTRA* (Ach.) Moberg, 1977: 47.

Basionym: *Parmelia sciastra* Ach., Methodus Lichenum (Supplement): 49. 1803.

*Phaeophyscia sciastra* can be distinguished by the dark, mostly marginal or submarginal isidia, the narrow lobes (mostly 0.15 to 0.5 mm broad) and the saxicolous habitat (also on mosses or soil over rock). Another isidiate species of similar habitat, *Ph. kairamoi* can be distinguished by the generally broader lobes (mostly 0.5-2 mm) and by the cortical hairs produced on the isidia (sometimes more like granular isidioid soredia) and on some lobe tips. The isidia of *Ph. sciastra* may become numerous, virtually covering central parts of the thallus, or they may be very sparse, in which case such specimens are sometimes misidentified as *Ph. decolor*. A careful search for isidia will usually distinguish the two, otherwise *Ph. decolor* can be separated from *Ph. sciastra* by its production of zeorin. The ascospores of *Ph. sciastra* are of the *Physcia*-type [16-20.5 x 7-10 µm], but apothecia are rare in North America.

The asexual propagules of this species are the most isidia-like of any of the species of *Phaeophyscia*. The tendency for these structures to occur in marginal or occasionally laminal clumps and to have a cortex different in appearance (darker and apparently thinner) from that on the upper surface of the lobes, may nevertheless indicate their basic nature as granular, strongly isidioid soredia. They vary in size, being (40-)50-120(-160) µm in diameter, mostly somewhat irregular but sometimes more or less cylindrical. The isidia of *Ph. kairamoi* are similar in appearance but, on occasion, even more soredia-like. The soredia of the many sorediate species of *Phaeophyscia* may at times also become pseudocorticate and thus isidioid, but this may be under the control of environmental factors.

Chemistry: All spot tests negative. No substances detected by TLC.

Representative Specimens: Idaho. Blaine Co.: Wood

River Campground, Sawtooth Rec. Area, *Hale 50092* (US); Boundary Co.: Copper Falls, Kaniksu Nat. Forest, *Hale 48224* (US). Michigan. Keweenaw Co.: Isle Royale National Park, *Wetmore 239* (DUKE). Minnesota. Cook Co.: Suzie Islands, *Thomson 3948* (DUKE). Montana. Gallatin Co.: Spanish Peaks Primitive Area, *Hale 49225* (US); Lincoln Co.: Kootenai Falls 6 mi. E of Troy, *Hale 48159, 48175, 48176* (US); Madison Co.: Bear Trap Canyon Primitive Area, *Hale 48132* (US); Missoula Co.: Holland Lake Campground, *Hale 48574* (US). North Dakota. Slope Co.: ca. 6.5 mi. N and 9 mi. W of Amidon, *Williams L174* (herb. Esslinger). South Dakota. Pennington Co.: just N of Hill City, *Hale 49998* (US). Washington. Pend Oreille Co.: N end of Sullivan Lake, *Esslinger 6047* (herb. Esslinger); Spokane Co.: foothills N of Millwood, *Esslinger 4796* (herb. Esslinger). Canada. Alberta: Banff National Park, Valley of Ten Peaks, *Hale 49533* (US); Ontario: Lake Nipigon, *Macoun*, 1884 (FH).

*PHYSCIA LUGANENSIS* Meresch., Ann. Conserv. Jard. Bot. Genève 21: 190. 1919. Type: Switzerland. Lugano, *Mereschkowsky*, 1919 (US, FH, syntypes).

Although long confused with *Phaeophyscia orbicularis* and other members of that genus, this is one of the more distinctive species included here. The pale lower surface and presence of terminal labriform soralia will separate this species from virtually all other K- Physciaceae. Occasional specimens of *Phaeophyscia hirsuta* have a pale lower surface (darkening only slightly and only in the older parts) and if the cortical hairs are overlooked or poorly developed, that species may be mistaken for *Ph. luganensis*. The latter species has a distinctly eastern distribution (Fig. 17) while the few known North American specimens of *Ph. hirsuta* are western. The two do overlap in the midwest, however, and questionable specimens from that area may require sectioning for examination of the lower cortex (prosoplectenchymatous in *Ph. luganensis* and paraplectenchymatous in *Ph. hirsuta*). *Physcia luganensis* was recently reported for North America by Esslinger (1973). Further discussion and description are provided there. This species is closely related to *Ph. melanchra* (q.v.).

The ascospores of *Ph. luganensis* and the following two related species are variable and somewhat less distinctly defined as to type than most of the *Phaeophysciae*. Basically, they are of the *Physcia*-type, but in many specimens the lumina of more mature spores become irregular or rounded rather than angular. The lumina may also become more elongate than usual. However, the thin side walls characteristic of *Physcia*-type spores are generally still obvious. The ascospores of *Ph. luganensis* are 17-22 x 8-10.5 µm.

Chemistry: All spot tests negative. No substances detected by TLC.

No specimens will be cited; see the distribution map (Fig. 17).

*PHYSCIA MELANCHRA* Hue, Nouv. Arch. Mus. Hist. Nat. Paris, ser. 4, 2: 75. 1900.

This species was known previously only from Japan (Kashiwadani, 1975). Although not as widespread or common in North America as closely related *Ph. luganensis*, at least locally (e.g. in some of the North Dakota localities), it is one of the more common species of macrolichens. The pale lower surface with prosoplectenchymatous cortex and the laminal to submargianl, punctiform or irregular soralia, will distinguish this species from all others. *Physcia luganensis* has mostly labriform soralia although some laminal soralia may also be present. The two species occasionally grow intermixed and must than be carefully distinguished. In western North Dakota this species was found growing intermixed with very similar appearing forms of *Phaeophyscia orbicularis*. When only the upper surface is viewed, the two species can look remarkably the same and in fact some mixtures could be sorted only by examination of the lower surface (dark to black in *Ph. orbicularis*). When fertile, the apothecia of *Ph. melanchra* lack the corona of rhizines at the base that is characteristic of *Ph. orbicularis* apothecia. The apothecia of *Ph. melanchra* are fairly common and tend to be slightly stipitate. Ascospores are *Physcia*-type [(14-)17-22 x (6-)7-10 µm] although lumina of some tend to become elongate and rounded as in *Ph. luganensis*. *Physcia melanchra* occurs equally commonly on bark and on rock.

Chemistry: All spot tests negative. No substances detected by TLC.

Representative specimens: Colorado. Yuma Co.: 6 mi. E of Wray, *Shushan & Anderson*, L32962 (DUKE). Massachusetts. Hampshire Co.: Amherst, *Tuckerman*, 1861 (FH); Franklin Co.: near Whately, *Esslinger 4044* (herb. Esslinger). Minnesota. Yellow Medicine Co.: 6 mi. SE of Montevideo, *Hale 23346* (US). North Dakota. Burleigh Co.: 13 mi. SW of Bismarck, *Esslinger 5590* (herb. Esslinger); La Moure Co.: Kulm, Wirch Lake, *Brenckle 1104* (FH, NDA); Dunn Co.: ca. 5.5 mi. N & 11.5 mi. W of Killdeer, *Esslinger 5762* (herb. Esslinger); Eddy Co.: vic. New Rockford, *Esslinger 5066* (herb. Esslinger); Slope Co.: ca. 7 mi. N and 5 mi. W of Amidon, *Esslinger 5665* (herb. Esslinger). Vermont. Chittenden Co.: Burlington, *Russell 322* (FH). Canada. Ontario: London, *Drummond*, 1865 (FH).

*PHYSCIA NEPALENSIS* Poelt, Khumbu Himal 6: 83. 1974.
Type: Nepal. Katmandu-Jawalakhel, 1400 m, *Poelt L1457* (M, holotype).

Two somewhat scrappy collections from the Southwest have been tentatively identified with this species. They agree with the type specimens of *Ph. nepalensis* in all particulars. In general appearance the specimens appear similar to *Physcia stellaris* (L.) Nyl., since the lower cortex is pale and prosoplectenchymatous. The upper cortex, however, lacks atranorin (K-) and is a dingier gray-white color than is typical for *Ph. stellaris*. If the K- upper cortex is noticed early in identification and the pale lower surface is overlooked, *Ph. nepalensis* may be identified as *Phaeophyscia ciliata* which has a dark or black, paraplectenchymatous lower cortex.

Altough originally described by Poelt (1974) as having *Pachysporaria*-type spores, the spores of both the type specimen (Fig. 8) and the only fertile North American specimen are of the *Physcia*-type; the lumina, however, vary from angular to oval or almost round. Their range in size is virtually identical [ca. 17-23.5 x 7-9 μm]. A somewhat similar Japanese species, *Physcia denigrata* Hue, has larger [ca. 24-29 x 10-11.5 μm], definitely *Pachysporaria*-type spores (Fig. 11 & 13) and generally larger thallus dimensions.

Chemistry: All spot tests negative. No substances detected by TLC.

Specimens examined: New Mexico. Santa Fe Co.: Santa Fe Canyon, on bark, *Arsène 20520* (FH). Texas. El Paso Co.: Fort Bliss, on *Ephedra & Cercocarpus*, *Clemens 11367* (FH).

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# Scirrhia filicina comb. nov. (Ascomycetes: Dothideales)

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Owing to the poor condition of many of the distributed isotypes of the species, and the ambiguity of Niessl's (Schroeter, 1874) brief original description, the correct application of the name *Stictis filicina* Niessl has long been in doubt. Rehm (1887-96) transferred the species to *Xylogramma* on the strength of Niessl's description, but found no asci or spores in the specimens he examined. In a survey of the genus *Stictis* (Sherwood, 1977) I examined two isotypes of the species (FH-Rabenhorst, Fungi Europaei 1709), finding them overmature and uncharacterizable.

Among specimens of *Stictis* sent to me by Josef Poelt (GRZ) for revision was another example of Fungi Europaei 1709 containing abundant fruiting material of a fungus corresponding to Niessl's description. The species is clearly neither a *Stictis* Pers. nor a *Xylogramma* Wallr., but rather a stromatic Loculoascomycete referrable to *Scirrhia* Fckl. s.l. in the Dothideales. According to Margaret Bigelow (*personal communication*), *Scirrhia* s.l. contains discordant elements, including aparaphysate species belonging to the Dothideales s. str., and pseudoparaphysate species belonging to the Pleosporales. The present species belongs to the Pleosporalean component, allied to *S. aspidiorum* (Lib.) Bubák. *Scirrhia filicina* differs from this and other species in the genus in having a reduced, almost colorless stroma. Obrist (1959) recognized a separate genus, *Scirrophragma* Theiss. & Sydow, for another species with light-colored stromata, *S. osmundae* (Peck & Curt.) Obrist; the two genera are united by Müller and von Arx (1962). *Scirrhia filicina* differs from *S. osmundae* (Peck & Curt.) Arx in having consistently 1-septate spores.

*Scirrhia filicina* is briefly redescribed below.

Scirrhia filicina (Niessl) Sherwood, comb. nov. (Figure 1)
≡ *Stictis filicina* Niessl, Bot. Jahresber. (Just) 2: 284 (1874)
≡ *Xylogramma filicina* (Niessl) Rehm *in* Rabenhorst, Kryptogamenfl. ed. 2, 1(3): 171 (1888)

Stromata subepidermal, almost colorless, inconspicuous, 0.5-1.0 x 0.2 mm, linear, becoming exposed by splitting the overlying substrate lengthwise. Stroma in cross section ca. 150 µm thick, of vertically-oriented, thin-walled pseudoparenchyma, the cells ca. 10 x 5 µm, colorless below, pale brown above. Pseudothecia arranged in a single line in the center of the stroma, spherical, lacking a prominent beak,

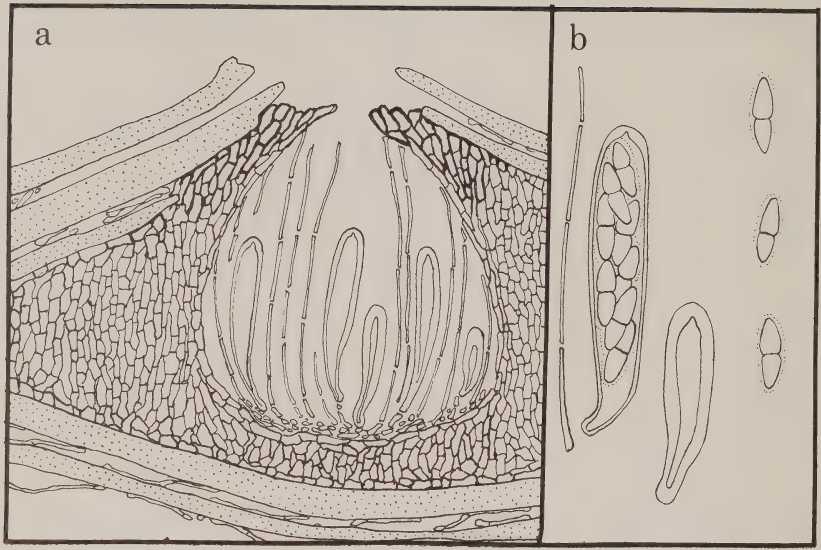

Figure 1. *Scirrhia filicina.* a. Cross section of stroma and pseudothecium, x375. b. Asci, pseudoparaphysis, and spores, x750. Stippled areas are host tissue. Drawn from GRZ-Rabenhorst, F. Eur. 1709.

ca. 100 μm diam. Asci 48-60 x 9-12.5 μm, bitunicate, 8-spored, accompanied by pseudoparaphyses. Ascospores 12-15 x 3.5-5.0 μm, 1-septate, constricted at the septum, narrowly sheathed. On dead stems of *Pteridium aquilinum,* Europe.

SPECIMEN EXAMINED: EUROPE: Austria (GRZ, Herb. J. Poelt 6864, Rabenh., F. Eur. 1709, auf *Pteridium aquilinum,* Voitsberg, Steiermark, leg. Niessl, isotype of *Stictis filicina*).

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# FILOSPORELLA, AN EARLIER NAME FOR COELOANGUILLOSPORA

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## SUMMARY

*Coeloanguillospora* Dyko & Sutton is placed into synonomy with *Filosporella* Nawawi, and comparison is made between *F. aquatica* Nawawi and *F. annelidica* (Shearer & Crane) Crane & Shearer. A full synonymy is given for the latter taxon.

Scolecosporous hyphomycetes with holoblastic conidial ontogeny are common in aquatic habitats; among the best known is *Anguillospora longissima* (Sacc. & Syd.) Ingold. Critical study has revealed other taxa with similar characteristics (Dyko & Sutton, 1978; Iqbal, 1971, 1972, 1974 a, b; Nawawi, 1976; Petersen, 1962, 1963; Ranzoni, 1952; Shearer & Crane, 1976; Wolfe, 1976). Genera represented in this group are *Anguillospora* Ingold, *Coeloanguillospora* Dyko & Sutton, *Filosporella* Nawawi, *Mycocentrospora* Deighton, *Pseudoanguillospora* Iqbal, *Rogersia* Shearer & Crane, and *Sigmoidea* Crane. While *Sigmoidea proliferata* (R. H. Pet.) Crane was originally described as phialidic, its conidial ontogeny is holoblastic with a sympodially proliferating conidiogenous cell and it should be considered in this group (Dyko, 1977).

With the great amount of study that aquatic and water-borne hyphomycetes are receiving at this time, it is not surprising that redundant introductions of taxa should occur. In addition, the specialized conidiomata which characterize the Melanconiales and the Tuberculariales intergrade and sometimes are reduced to separate discrete conidiophores in culture thus leaving no clear separation between these two groups and the Moniliales (Mason, 1937; Sutton, 1973). *Coeloanguillospora appalachiensis* Dyko & Sutton (1978) was first described from cultures obtained from submerged decaying leaves. Scolecosporous conidia were produced holoblastically in cupulate fruiting structures. It was found later that upon submergence, conidia were produced on loosely-arranged branched conidiophores typical of *Filosporella* Nawawi. While annellides seemed to occur infrequently in our isolate, and no previous description of any *Filosporella* species mentioned cupulate fruiting structures in culture, comparison with the type of *F. annelidica* (Shearer & Crane) Crane & Shearer showed the two fungi to be conspecific. Additionally, after study of our isolate and comparison with published descriptions of *Anguillospora pulchella* Wolfe and *A. virginiana* Wolfe (Wolfe, 1971, 1976) it appeared certain that these two fungi were also later synonyms of *F. annelidica*. Wolfe (1971) was the first to recognize this taxon as being distinct from *A. longissima*. His name, *A. pulchellus*, would normally provide the earliest specific epithet but description in a doctoral dissertation is not recognized as effective publication by the International Code of Botanical Nomenclature (Art. 29). The name was validly published later by Wolfe (7 March, 1977) and Dyko (1977) concluded that *A. virginiana*, which was described simultaneously with *A. pulchellus*, was merely a growth form of the same fungus. Regrettably the holotypes of both *A. pulchellus* and *A. virginiana*, although reported as at VPI (Wolfe, 1977), could not be located there. Authentic material could not be obtained from the author.

*Rogersia annelidica* Shearer & Crane (13 October, 1976), type species of the genus, was soon found to be identical with *Filosporella aquatica* Nawawi (18 September, 1976), the type species of that genus. The two genera, therefore, were placed in synonymy (Crane & Shearer, 1977). Conversely, we find the two to be quite distinct.

The conidia of *F. aquatica* tend to be clavate with quite blunt apices during development, and by maturity the apices gradually taper to a point: the mature conidia are usually straight or slightly curved. The conidiogenous cells give the appearance of percurrently proliferating but annellations are a considerable distance apart (9-20μ) and no frill of wall material can be discerned between the proliferations either with bright field or interference contrast (Nomarski) phase optics. These percurrent proliferations are septate and constricted between each unit thus giving a beaded appearance to old conidiogenous structures.

The conidia of *F. annelidica* tend to have acute apices during development and at maturity are quite sharply acute, tapering abruptly to the apex; the mature conidia are curved to sigmoid. The conidiogenous cells are cylindrical, later percurrently proliferating with the annellations closely spaced (1-5μ apart), with no apparent septation between the slightly flared frill of wall tissue which marks each proliferation.

It appears that conidial ontogeny in *F. aquatica* is somewhat different from that in *F. annelidica*. Perhaps after additional study of conidiogenesis in *F. aquatica,* the two taxa may require separation into different genera; in that event, *Rogersia* Shearer & Crane could be resurrected. Until additional evaluation of these two taxa is effected, we suggest the following synonymy:

*Filosporella annelidica* (Shearer & Crane) Crane & Shearer. 1977. Mycotaxon. 6: 28.

*Rogersia annelidica* Shearer & Crane. 1976. Mycologia. 68: 949. (pub. 13 Oct. 1976)

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*Anguillospora virginiana* Wolfe. 1976. in Parker & Roane, Eds., Dist. Hist. Biota S. Appalachians. p. 249. (pub. 7 March 1977).

*Coeloanguillospora appalachiensis* Dyko & Sutton. 1978. Nova Hedwigia. 29: 171-172.

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# NOTES ON HYPHOMYCETES. XXIV.
# *PHIALOPHORA PINICOLA* SP. NOV. AND *PHIALOPHORA BUBAKII*

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## ABSTRACT

*Phialophora pinicola* Morgan-Jones, a new species, is described and illustrated from isolates from galls caused by *Cronartium quercuum* f.sp. *fusiforme* on *Pinus taeda* in Alabama. It is compared with *Phialophora bubakii* (Laxa) Schol-Schwarz which is similarly treated.

## INTRODUCTION

Two conspecific isolates belonging to the genus *Phialophora* Medlar were obtained during studies on hyphomycetes associated with aecial galls of *Cronartium quercuum* f. sp. *fusiforme* on *Pinus taeda* in Alabama. A comparison with known species of *Phialophora* indicates that they represent an undescribed taxon. The isolates resemble most closely *Phialophora bubakii*, but differ from this species in a number of respects, particularly in the arrangement of the phialides and dimensions of the conidia. A resemblance to *Phialophora lignicola* (Nannfeldt) Goidanich is also evident, but again differences exist in conidium size and in conidium shape. A name is proposed herein to accomodate these isolates. Both the new species and *P. bubakii* are described, the latter from two cultures, including the type.

## TAXONOMIC PART

*Phialophora pinicola* sp. nov. (Fig. 1).

Coloniae in agaro 'malt'dictu vel in agaro decocto tuberorum post 5 dies 25° C ad 4 - 5 cm. diametro, celeriter crescentes, velutinae vel coactae, rubrobrunneae dein atrobrunneae. Hyphae immersae subhyalinae ad pallide brunneae, ramosae, laeves, 3 - 5 μ latae. Hyphae aeriae subhyalinae ad pallide brunneae, ramosae, laeves, interdum funiculosae, 2 - 9 μ latae. Conidiophora semimacronemata, mononemata, simplicia vel ramosa, subhyalina vel pallide

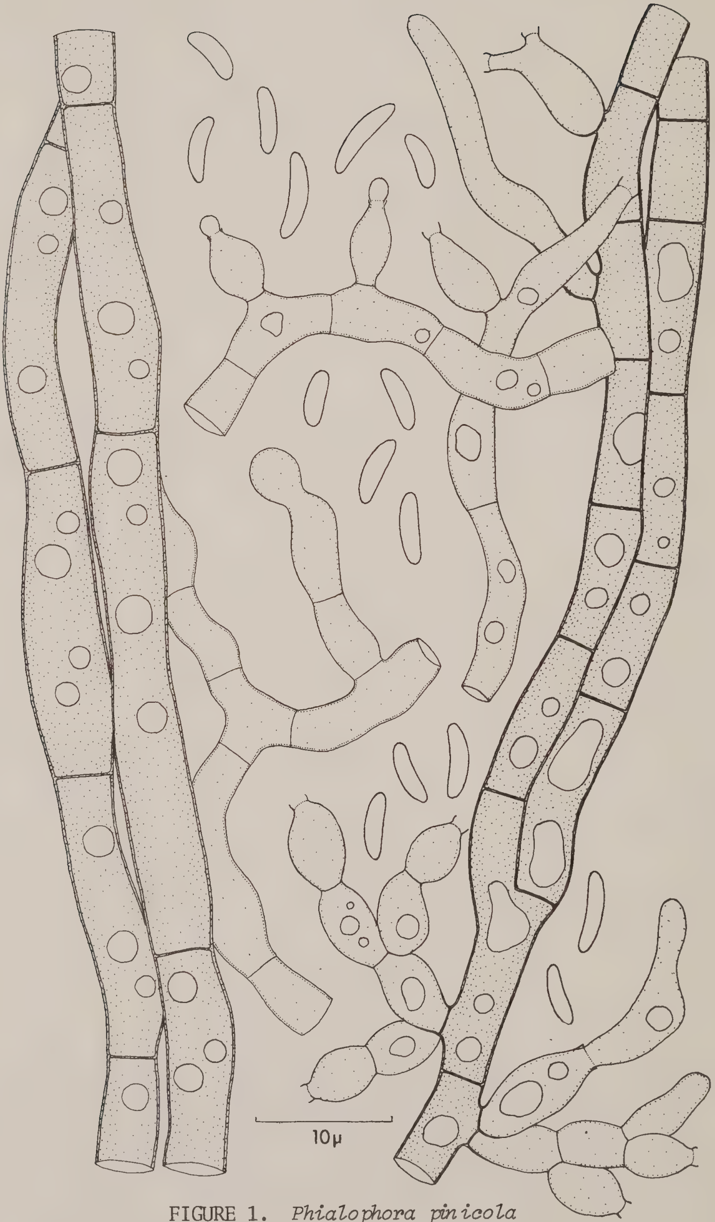

FIGURE 1. *Phialophora pinicola*

brunnea, laevia. Cellae conidiogenae monophialidicae vel polyphialidicae, terminales vel laterales, discretae, ampulliformes, laevis, cum collis minutis, 5 - 9 X 2.5 - 3.5 μ. Conidia hyalina aseptata, allantoidea, laevia, 2.5-5 X 1 μ.

Isolatus ex aecidiis Cronartii, Auburn, Lee County, Alabama, July 15, 1976, W.D. Kelley, CBS 552.76 holotypus.

Colonies on 2% malt agar spreading slowly, at first thin and pale brown, later becoming velvety, dark brown to black, with reverse dark gray, 4 cm. in diameter after 5 days at 25° C. Colonies on PDA growing well, velvety to felted, frequently producing rope-like strands, reddish brown to dark brown, becoming black with age, at first with a faint concentric zonation, aerial hyphae producing a superficial cream to pale brown coloration particularly towards the margin, 5 cm. in diameter after 5 days at 25° C. Colonies on corn meal agar extremely thin, pale brown, with little or no aerial mycelium produced, 3 cm. wide after 5 days at 25° C. Immersed mycelium composed of subhyaline to pale brown, branched, interwoven, smooth, 3 - 5 μ wide hyphae. Aerial hyphae subhyaline to pale brown, branched, smooth, vacuolate, 2 - 9 μ wide; broader hyphae becoming darker and thicker walled with age, frequently aggregated to form hyphal strands. Conidiophores semimacronematous, mononematous, simple or branched, subhyaline to very pale brown, smooth. Conidiogenous cells mono or polyphialidic, terminal or lateral, discrete, ampulliform, smooth, bearing a small collarette, rarely proliferating percurrently, borne in irregular clusters on lateral conidiophores or singly on repent or aerial hyphae, 5 - 9 X 2.5 - 3.5 μ. Conidia hyaline, aseptate, allantoid, smooth, 2.5 - 5 X 1 μ.

On aecial galls of *Cronartium quercuum* (Berk.) Miyabe ex Shirae f. sp. *fusiforme* on *Pinus taeda* L.; North America.

Collections examined: two isolates from *Pinus taeda,* Auburn, Lee County, Alabama, July 15, 1976, W.D. Kelley, CBS 552.76, ATCC 36388 (type); CBS 553.76. Dried cultures in herb AUA, BPI.

*Phialophora bubakii* (Laxa) Schol-Schwarz, Persoonia 6: 66, 1970 (Fig. 2).

≡ *Margarinomyces bubaki* Laxa, Zentbl. Bakteriol. ParasitKde., 2 Abt. 81: 392, 1930.

= *Cadophora obscura* Nannfeldt, Svenska Skogsvardsfören. Tidskr. 32: 418, 1934.

≡ *Phialophora obscura* (Nannf.) Conant, Mycologia 29: 598, 1937.

Colonies on 2% malt agar spreading slowly, at first thin, zonate, later becoming velvety and somewhat funiculose

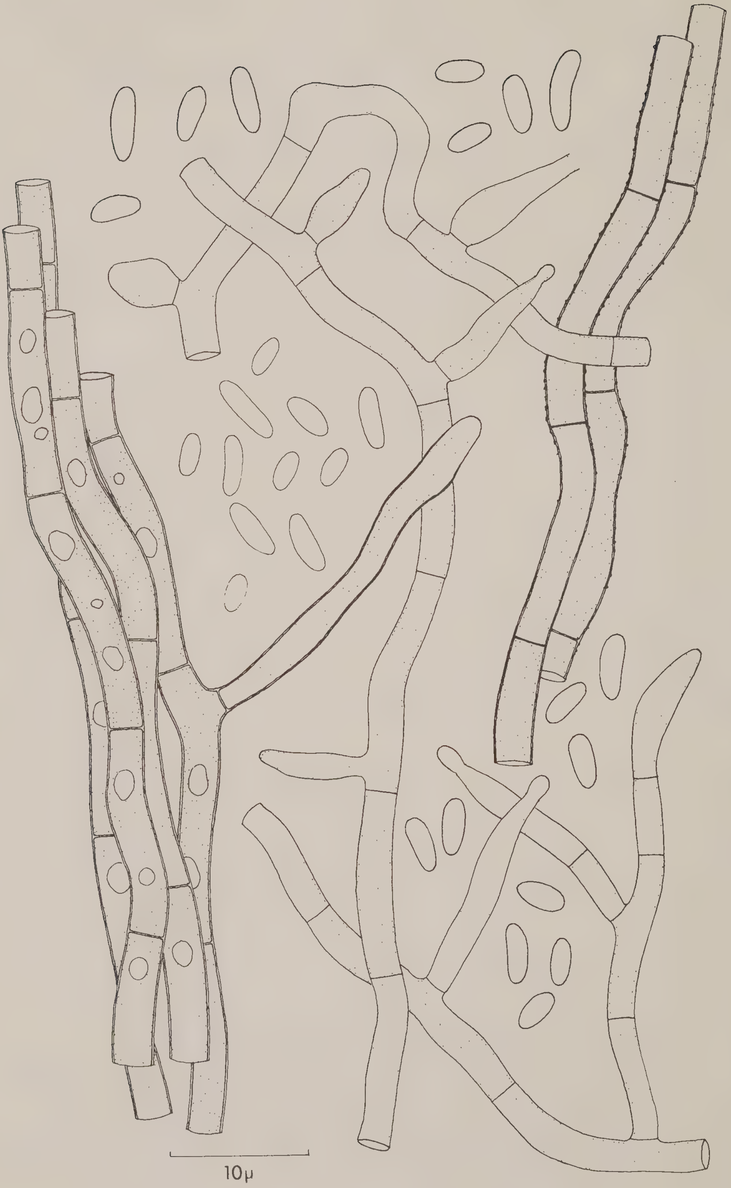

FIGURE 2. *Phialophora bubakii*

towards the center, grayish olive, margin much lighter, with blackish-olive reverse, 2 - 3 cm. in diameter after 5 days at 25° C. Immersed mycelium composed of pale olivaceous brown hyphae, branched, interwoven, smooth, 3 - 4 μ wide. Aerial hyphae subhyaline to olivaceous brown, smooth, often vacuolate, flexuous, becoming thicker-walled and darker with age, sometimes verruculose, frequently aggregated to form hyphal strands up to 30 μ broad, individual hyphae 2.5 - 5 μ wide. Subhyaline to very pale brown, ellipsoid to subglobose chlamydospores sometimes formed laterally on aerial hyphae. Conidiogenous cells monophialidic, terminal or lateral on hyphae, discrete, cylindrical to narrowly flask-shaped, smooth, sometimes proliferating percurrently, usually solitary, more rarely in groups of a few, 6 - 15 X 1.5 - 2 μ. Conidia dimorphic, variable in shape and size, hyaline, aseptate, allantoid or ovoid to elliptical, 2 - 6 X 1 - 3 μ.

Isolated from margarine, fresh water and wood pulp; Europe.

Collections examined: type culture of *Margarinomyces bubaki*, CBS 198.30; isol. sub *Phialophora obscura*, ex wood pulp, Sweden, det. E. Melin, DAOM 29103.

## DISCUSSION

Several morphological features, as well as cultural characteristics, serve to distinguish *P. pinicola* from its nearest relatives. The arrangement of the conidiogenous cells in groups on conidiophores is reminiscent of the structure of *P. lignicola* but in that species the conidia are dimorphic (Schol-Schwarz, 1970). The cylindrical conidia formed in young cultures are appreciably larger than those of *P. pinicola* and the ovoid conidia produced in older cultures are different in shape. *P. bubakii* differs from *P. pinicola* in possessing more slender conidiogenous cells which are usually borne in a solitary manner. The variable conidia of *P. bubakii* further distinguish this species, although *P. bubakii* produces some allantoid conidia that resemble those of *P. pinicola*.

Cole and Kendrick (1973) chose to maintain the generic name *Margarinomyces* Laxa for *P. bubakii*.Whilst admittedly the conidiogenous cells of *P. bubakii* are not as well differentiated as those of other species of *Phialophora*, I do not concur with their view that a separate genus is needed to accommodate this species. The broader generic concept adopted by Schol-Schwarz (1970) and Ellis (1976) for the genus *Phialophora* is preferable. *P. pinicola*, with its rather more differentiated conidiogenous cells bearing small collarettes, provides a link between *P. bubakii* and the main body of *Phialophora* as presently accepted.

## ACKNOWLEDGEMENTS

I thank Dr. Walter D. Kelley for the opportunity to study his isolates. Dr. Luella K. Weresub, Biosystematics Research Institute, Ottawa, kindly sent on loan the dried culture named *P. obscura* originating in Sweden and Dr. Walter Gams, Centraalbureau voor Schimmelcultures, Baarn, provided the culture of *M. bubakii*. The benefit of consultation with Drs. Gams and G.S. de Hoog is also acknowledged. I am grateful to Dr. Roger D. Goos, University of Rhode Island, for reviewing the manuscript.

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# NOTES ON HYPHOMYCETES. XXV. CONCERNING *EVERSIA SUBOPACA*.

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## ABSTRACT

*Eversia subopaca* (Cooke and Ellis) Crane and Schoknecht is described and illustrated from fresh collections made in Alabama.

## INTRODUCTION

Material of *Eversia subopaca* has recently been collected on rotten decorticated wood in Alabama. Schoknecht and Crane (1977) described this fungus from a number of old collections. Three of these were from Gloucester County, New Jersey, one from Fayette County, West Virginia, and one from Italy; all made during the latter part of the last century. The fifth and only other collection known hitherto, obtained in Japan in 1967 and described by Matsushima (1975) under the name *Cheiromycella annulata*, was also examined by these authors. Detailed description and illustrations are provided herein based on two new collections from Alabama.

## TAXONOMIC PART

*Eversia subopaca* (Cooke and Ellis) Crane and Schoknecht, Mycologia 69: 539, 1977 (Figs. 1 and 2). [for full nomenclator see Schoknecht and Crane (1977)]

Colonies effuse, chocolate brown, with small black areas where conidia are produced, felted. Mycelium partly superficial, mostly immersed, composed of cylindrical, flexuous, heavily branched, septate, subhyaline to pale brown, smooth-walled, 1.5 - 2.5μ wide hyphae. Conidiophores semi-macronematous to macronematous, mononematous, simple or frequently branched, erect, abundantly septate, distinctly constricted at the septa, straight or flexuous, smooth, very pale brown, distal conidiogenous cell often noticeably darker and thicker walled than the subtending cells,

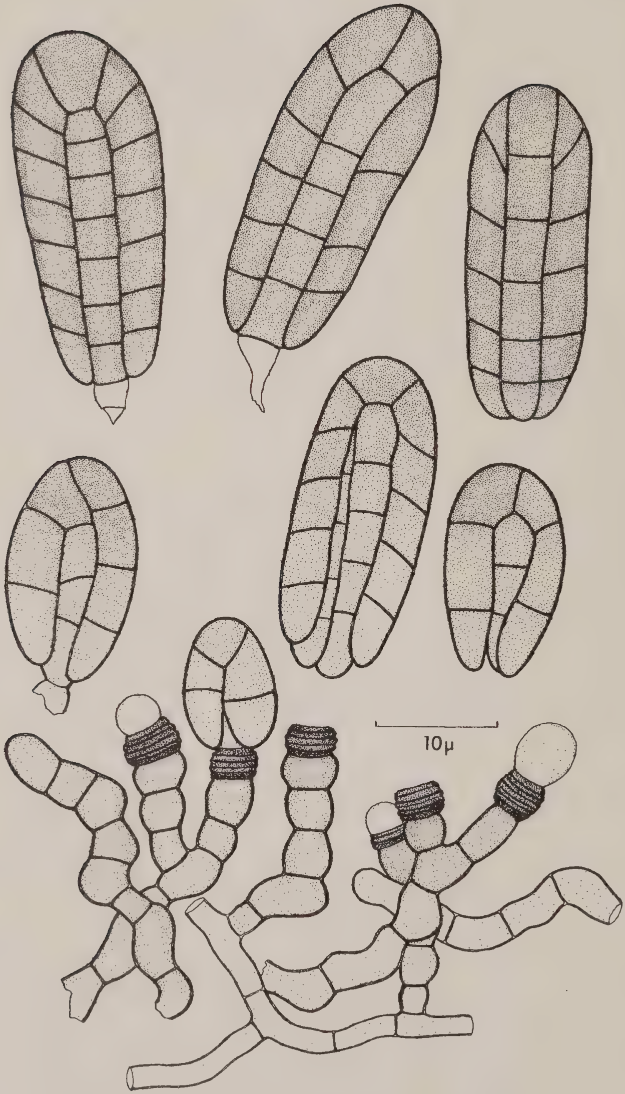

FIGURE 1. *Eversia subopaca*

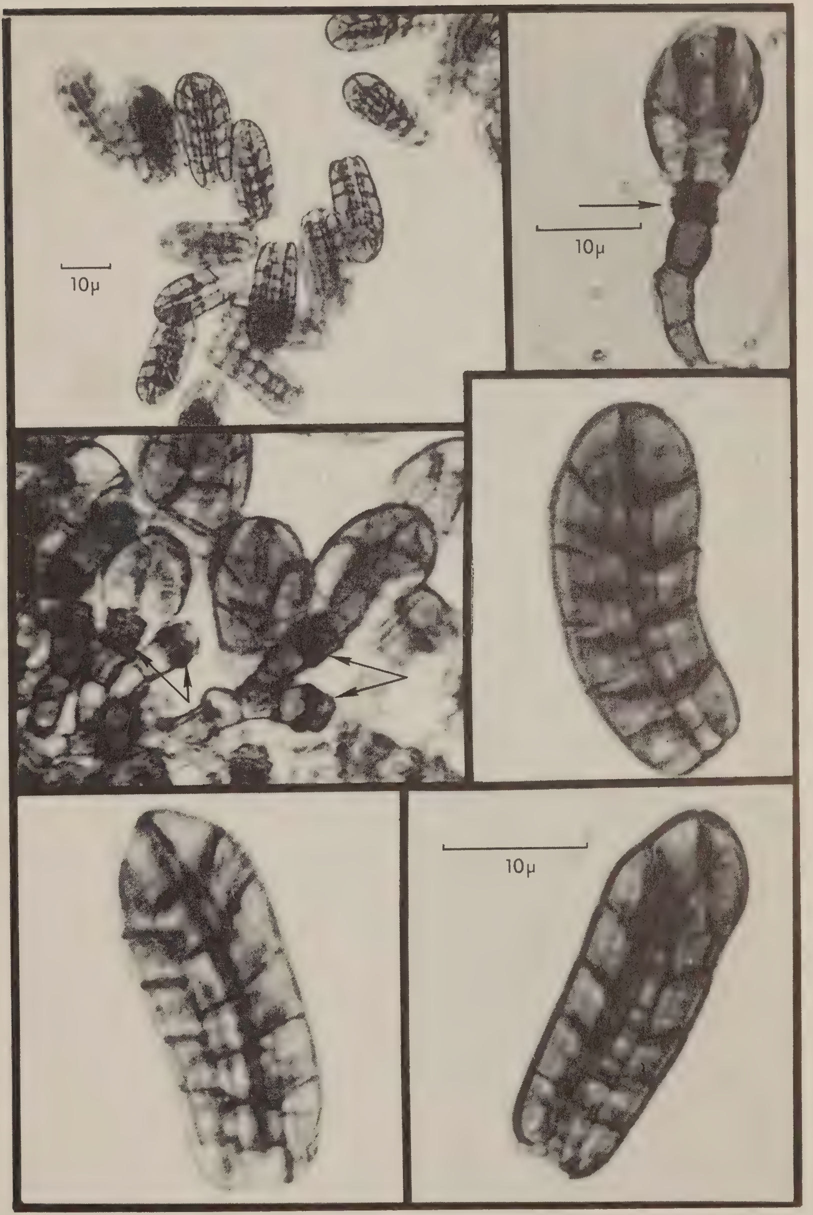

FIGURE 2. *Eversia subopaca.* Arrows indicate conidiophore annellations

15 - 28 X 3 - 4μ. Conidiogenous cells holoblastic, integrated, terminal, indeterminate, doliiform, pale brown, proliferating percurrently and bearing up to seven thick, dark brown, 4 - 5μ wide annellations. Conidia solitary, acrogenous, branched, compactly cheiroid, with a central axis attached to the conidiogenous cell and 2 to 4 closely appressed, downwardly orientated arms, septate, brown, when young tips of arms subhyaline, smooth, 25 - 27 X 10 - 11μ, individual conidial arms 3 - 4μ wide.

On dead wood; Europe, North America, Japan.

Collections examined: on decorticated wood, Chewacla State Park, Lee County, Alabama, July 1976, G. Morgan-Jones, AUA; on decorticated wood, Tuskegee National Forest, Macon County, Alabama, October 1977, R.C. Sinclair, BPI, AUA.

I have also had opportunity to examine the type specimen of *Torula bigemina* Cooke and Ellis, on rotten wood, Newfield, Gloucester County, New Jersey, May 24, 1878, housed in herb, NY. I am able to confirm that it is identical with *E. subopaca*.

## ACKNOWLEDGEMENT

I thank Dr. Clark T. Rogerson, The New York Botanical Garden, for the loan of the material of *T. bigemina* and Dr. Richard T. Hanlin, The University of Georgia, for reviewing the manuscript.

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# SYNOPSIS OF WOOD-ROTTING FUNGI ON SPRUCE IN NORTH AMERICA: II[1]

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## *SUMMARY*

Ninety-nine species of wood-rotting basidiomycetes in the family Polyporaceae are reported to occur on eight species of North American spruces.

The first part of this series (Martin and Gilbertson, 1977) included keys to higher taxa and a synopsis of the Corticiaceae. Part II is a synopsis of the family Polyporaceae sensu stricto. In this restricted sense the polyporoid genera of the Hymenochaetaceae are excluded and will be treated in part III. *Ganoderma* is included although commonly placed in the family Ganodermataceae in recent literature.

The taxonomy of the Polyporaceae is currently in a state of flux due to efforts to determine natural generic groupings and a general move away from the practical but artificial Friesian system. As a result many genera have been proposed and the nomenclatural validity and taxonomic merit of all these taxa have yet to be elucidated. Recent workers who have made important contributions in this area are Donk (1960, 1974), W. B. Cooke (1960), Pegler (1966), and Ryvarden (1976). Ryvarden's manual for identification of Polyporaceae of North Europe probably best exemplifies current trends in polypore taxonomy. He recognizes 62 genera in a mycoflora that approximates that of North America. The genera reported in this synopsis of spruce-decaying polypores are, for the most part, also found in Ryvarden's work. A major difference is that we have utilized the artificial genus *Poria* to accommodate species with resupinate basidiocarps. We prefer to follow this expedient until the taxonomy of this difficult group is more

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firmly stabilized. More detailed information on pileate North American polypores can be found in Overholts (1953). Lowe (1966) has published a comprehensive treatment of the resupinates.

Species of spruce are denoted by numbers as follows: 1, *Picea breweriana*; 2, *P. engelmannii*; 3, *P. glauca*; 4, *P. mariana*; 5, *P. pungens*; 6, *P. rubens*; 7, *P. sitchensis*; 8, *P. chihuahuana*; 9, *Picea* sp.

Abbreviations designating geographical localities are AK, Alaska; AZ, Arizona; AT, Alberta; BC, British Columbia; CA, California; CO, Colorado; CH, Chihuahua; CT, Connecticut, ID, Idaho; MA, Massachusetts; MB, Manitoba; ME, Maine; MI, Michigan; MN, Minnesota; MT, Montana; NB, New Brunswick; NC, North Carolina; NF, Newfoundland; NH, New Hampshire; NM, New Mexico; NWT, Northwest Territories; NS, Nova Scotia; NY, New York; OR, Oregon; OT, Ontario; PA, Pennsylvania; PEI, Prince Edward Island; QB, Quebec; SK, Saskatchewan; SD, South Dakota; TN, Tennessee; UT, Utah; VT, Vermont; WA, Washington; WS, Wisconsin, WY, Wyoming, YT, Yukon Territory.

## Family POLYPORACEAE

### Key to the genera

1. Basidiocarps stipitate, sessile or effused-reflexed, sometimes resupinate at first . . . . . . . . . . . . . . . . . . . . 2
1. Basidiocarps typically resupinate at all stages of development (see also *Coriolellus*). . . *Poria* Pers. ex S.F. Gray
    2. Basidiospores brown, truncate, with a pitted exospore . . . . . . . . . . . . . . . . . . . . . . . *Ganoderma* Karst.
    2. Basidiospores hyaline, not with a pitted exospore . . . . 3
3. Basidiocarps annual, rarely reviving a second year . . . . . 4
3. Basidiocarps perennial, tubes typically stratified . . . . . . . . . . . . . . . . . . . . . . . . *Fomitopsis* Karst.
    4. Hymenophore in form of united tubes, or sometimes becoming hydnaceous from splitting of tubes . . . . . . . . . . . 5
    4. Hymenophore in form of radial lamellae (See also *Hirschioporus laricinus*) . . . . . . . . *Gloeophyllum* Karst.
5. Context tissue brown, bright colored, or whitish, if turning red in KOH solution then tissue bright colored . . . . . . . . . 6
5. Context tissue brown, turning red to purplish in KOH solution . . . . . . . . . . . . . . . . . . . . . *Hapalopilus* Karst.

*Hapalopilus nidulans* (Fr.) Karst. Basidiocarps sessile, dimidiate, upper surface and pore surface yellowish brown; hyphal system dimitic, generative hyphae with clamps; basidiospores ovoid to ellipsoid, 3-4 x 2-3 µm. White rot on 2 in AZ.

    6. Contextual generative hyphae septate, with or without clamps; cystidia absent or if present barely projecting and/or incrusted . . . . . . . . . . . . . . . . . . . . . . . . 7
    6. Contextual hyphae simple-septate; large non-incrusted cystidia present . . . . . . . . . . . . *Phaeolus* (Pat.) Pat.
7. Generative hyphae simple-septate (See also *Tyromyces mollis*). 8
7. Generative hyphae with clamps, sometimes difficult to find in some species with a dimitic hyphal system . . . . . . . . 9

8. Basidiocarps stipitate; upper surface yellowish to tan or purplish brown; pore surface whitish; basidiospores spiny, amyloid . . . . . . . . . . . . . . . . . *Bondarzewia* Sing.
8. Basidiocarps sessile or substipitate; upper surface orange; pore surface sulfur yellow; basidiospores smooth, not amyloid . . . . . . . . . . . . *Laetiporus* Murr.

*Laetiporus sulphureus* (Bull. ex Fr.) Bond. et Sing. Basidiocarps often densely imbricate, bleaching to a white crumbly mass after weathering; contextual hyphae of two types, some thin- to thick-walled, aseptate, much branched and interlocking; others thin-walled, simple-septate, rarely branched; basidiospores ovoid to ellipsoid, 5-7.5 x 4-5 µm. Brown rot on 2 in BC, ID; 3 in BC, ME; 7 in AK, BC, OR, WA.

9. Basidiocarps centrally to laterally stipitate . . . . . . . . 10
9. Basidiocarps sessile or effused-reflexed . . . . . . . . . . 12
   10. Basidiocarps fibrous to corky when dried . . . . . . . . 11
   10. Basidiocarps hard and bone-like on drying . . . *Osteina* Donk

*Osteina obducta* (Berk.) Donk. Pileus circular, dimidiate, or spathulate; upper surface light buff to grayish; pore surface cream-colored to yellowish; basidiospores oblong-ellipsoid, 4-6 x 2-2.5 µm. Brown rot on 2 in CO; 7 in BC.

11. Basidiocarps usually consisting of a single pileus on an unbranched stipe . . . . . . *Polyporus* Mich. ex Fr. emend Donk
11. Basidiocarps consisting of numerous small pilei on branches from a common stipe . . . . . . . . . . . . . *Polypilus* Karst.

*Polypilus umbellatus* (Pers. ex Fr.) Bond. et Sing. Basidiocarps whitish to grayish brown; pore surface white, drying yellowish; stem arising from an underground tuber-like sclerotium; hyphal system dimitic with branching skeletal hyphae; basidiospores cylindric-ellipsoid, 7-10 x 3-4 µm. On 2 in MT.

   12. Upper surface of basidiocarps glabrous to hispid; basidiospores cylindric . . . . . . . . . . . . . . . . 13
   12. Upper surface of basidiocarps coarsely radially fibrillose; basidiospores ovoid . . . . *Abortiporus* Murr.

*Abortiporus borealis* (Fr.) Sing. Basidiocarps sessile or substipitate, white when fresh, drying yellowish; context two-layered, upper layer thin, soft and floccose; lower layer fibrous and hardening; cystidia ventricose or fusoid, thick-walled above, thin-walled below; basidiospores 4.5-7 x 3.5-5 µm. White butt and root rot on 2 in AZ, BC, CO, ID, MT, OR; 3 in BC, MN, NB; 4 in MN; 6 in NB, NS, NY, TN, VT; 7 in AK, BC, OR; 9 in NB, NS.

13. Hyphal system monomitic although some hyphae may become thick-walled . . . . . . . . . . . . . . . . . . . . . . . . . . 14
13. Hyphal system dimitic or trimitic with distinct generative and skeletal hyphae . . . . . . . . . . . . . . . . . . . . . . . . 17
   14. Pore surface of various colors but not smoky gray . . . . 15
   14. Pore surface smoky gray . . . *Bjerkandera* Karst. emend. Murr.

*Bjerkandera adusta* (Willd. et Fr.) Karst. Basidiocarps sessile or effused-reflexed, usually imbricate, usually less than 1 cm thick; upper surface whitish or cinereous to smoke gray or pale tan; tramal tissue pale brownish in KOH; dark layer at base of tubes usually distinct; pores minute, 5-7 per mm; basidiospores short-cylindric, 5.5-5 x 2.5-3 µm. White rot on 2 in MT; 3 in BC, MN, YT; 7 in OR.

15. Context fibrous or corky, no gelatinous layer between tubes and upper context; associated with white or brown rots . . . . . . 16
15. Context with a gelatinous layer between tubes and upper context; associated with a white rot . . . . . . *Gloeoporus* Mont.

*Gloeoporus dichrous* (Fr.) Bres. Basidiocarps sessile or effused-reflexed; often imbricate; upper surface gray to buff, zonate; margin ivory; pore surface pale to dark purplish; hyphae of lower context thin-walled; hyphae of upper context thick-walled; basidiospores allantoid, 4-6 x 1 µm. On 2 in MT; 6 in NY.

16. Contextual hyphae, tramal hyphae, and cystidia, if present, not amyloid . . . . . . . . . . . . . . . . *Tyromyces* Karst.
16. Contextual hyphae, tramal hyphae, and cystidia amyloid, at least in part . . . . . . . . . . *Amylocystis* Bond. et Sing.

*Amylocystis lapponica* (Rom.) Bond. et Sing. Basidiocarps sessile, whitish, becoming reddish brown on bruising or drying; upper surface often hispid; hyphae thin- to thick-walled; cystidia bottle-shaped or cylindric, frequently incrusted at the apex; basidiospores cylindric, 8-11 x 2.5-3.5 µm. Brown cubical rot on 2 in AT, AZ, BC, MT, UT; 3 in AT, BC, NH; 6 in NH; 7 in BC; 9 in AZ, BC, CO, WY.

17. Pore surface not purplish; cystidia absent or if present, not incrusted . . . . . . . . . . . . . . . . . . . . . . . . . . 18
17. Pore surface purplish when fresh; capitately incrusted cystidia present . . . . . . . . . . . . . . . . . *Hirschioporus* Donk
18. Pore surface exposed, volva not present . . . . . . . . . 19
18. Pore surface enclosed in a volva with a small basal opening . . . . . . . . . . . . . . . *Cryptoporus* (Pk.) Shear

*Cryptoporus volvatus* (Pk.) Hubbard. Basidiocarps sessile, ungulate; upper surface cream colored to yellowish or tan, often coated with a clear lacquer-like layer; pore surface pale to dark chocolate brown; hyphal system trimitic; generative hyphae with irregular swellings; basidiospores cylindric, 9.5-12 x 3.5-4 µm. White rot on 2 in CO, MT, OR; 3 in AT, BC, MB, NWT, QB, OT; 7 in BC, OR, WA.

19. Context, upper surface, and pore surface of various colors but not reddish orange . . . . . . . . . . . . . . . . . . . . . . . 20
19. Context, upper surface, and pore surface reddish orange . . . . . . . . . . . . . . . . . . . . . . . . . *Pycnoporus* Karst.

*Pycnoporus cinnabarinus* (Jacq. ex Fr.) Karst. Basidiocarps sessile or effused-reflexed, dimidiate to elongated; hyphal system trimitic; hyphal pegs abundant; basidiospores short-cylindric, straight or slightly curved, 6-8 x 2.5-3 µm. White rot on 2 in CT, ME, NH, NS, NY; 9 in NC, NY.

20. Pore surface white to cream colored or brownish; context thick or thin . . . . . . . . . . . . . . . . . . . . . . 21
20. Pore surface orange to pinkish; context thin . . . . . . . . . . . . . . . . . . *Skeletocutis* Kotl. et Pouz.

*Skeletocutis amorphus* (Fr.) Kotl. et Pouz. Basidiocarps effused-reflexed to resupinate; upper surface grayish to light buff, tomentose to hirsute; margin usually undulate; hyphal system dimitic, generative hyphae becoming thick-walled; basidiospores allantoid, 3-4.5 x 0.5-1 µm. White rot on 2 in BC, ID, MT; 3 in BC; 7 in AK; 9 in AK, PA.

21. Skeletal hyphae not branching dendritically . . . . . . . . . 22
21. Skeletal hyphae branching dendritically . . . *Dichomitus* D. Reid

*Dichomitus squalens* (Karst.) D. Reid. Basidiocarps usually effused-reflexed, often imbricate, upper surface white to pale reddish brown; pore surface white; hyphal system dimitic; basidiospores cylindric, 8-12 x 3-4 µm. White rot of 2 in AZ, CO, MT, NM; 3 in AK, MB, MN, NS, NWT, SK; 4 in MN, NB, NF, NY; 6 in CT, ME, NH, NY, VT; 7 in AK; 9 in OT.

22. Upper surface of basidiocarps of various shades of white, gray, yellowish, brownish or blackish, if reddish brown not becoming radially rugose . . . . . . . . . . . . . . . . . 23
22. Upper surface of basidiocarps dark reddish brown and becoming radially rugose . . . . . . . . . . *Ischnoderma* Karst.

*Ischnoderma resinosum* (Schrad. ex Fr.) Karst. Basidiocarps sessile or effused-reflexed, solitary or imbricate; pore surface cream colored to pinkish buff, turning darker brown where bruised; tubes separated from context by a thin, dark layer; hyphal system dimitic; basidiospores cylindric, often curved, 5-7 x 1.5-2 µm. White rot on 2 in ID, MT; 3 in BC; 6 in CT, ME, NH, NY; 7 in WA; 9 in NS, NY.

23. Pores typically daedaloid or sometimes lamellate . . . . . . 24
23. Pores circular to angular, not typically daedaloid . . . . . 25
24. Basidiocarps sessile, dimidiate; upper surface grayish to brownish . . . . . . . . . . . . . . *Daedaleopsis* Schroet.

*Daedaleopsis confragosa* (Bolt. ex Fr.) Schroet. Surface of pileus zonate; hyphal system trimitic; basidiospores cylindric, slightly curved, (6)8-11 x 2-3 µm, 2-3 guttulate. White rot on 9.

24. Basidiocarps thin, effused-reflexed; upper surface becoming blackish . . . . . . . . . . . . . . . . . . . *Datronia* Donk

*Datronia mollis* (Sommerf. ex Fr.) Donk. Surface of pileus often with irregular concentric zones, covered with a thin crust; margin sharply delineated, more or less undulate; basidiospores cylindric, slightly curved, 8-10 x 2.5-3.5 μm. On 3 in AT.

25. Basidiocarps thin, coriaceous; upper surface tomentose to hirsute, usually zonate and sulcate; associated with a white rot . . . . . . . . . . . . . . . . . . . . . . . . *Coriolus* Quél.
25. Basidiocarps thin to thick; upper surface not distinctly zonate and sulcate; associated with a brown or white rot . . 26
    26. Tissue white to brownish, if brown then pores more or less hexagonal; fresh basidiocarps and rot not with an anise odor . . . . . . . . . . . . . . . . . . . . . . . . . 27
    26. Tissue brownish, pores circular or daedaloid; fresh basidiocarps and rot with an anise odor . . . . . . *Osmoporus* Sing.

*Osmoporus odoratus* (Wulf. ex Fr.) Sing. Basidiocarps sessile or effused-reflexed; upper surface rusty brown, coarsely strigose to tomentose or darkening and glabrous with age; pore surface yellowish brown, pores 2-3 per mm; hyphal system dimitic; basidiospores cylindric, 9-13 x 3.5-5 μm. Brown rot on 3 in AK, YT; 9 in NB, NS.

27. Pores usually large, 1-5 per mm; associated with a brown rot . . . . . . . . . . . . . . . . . . . . . . . . *Coriolellus* Murr.
27. Pores usually small, 4-10 per mm; associated with a white rot . . . . . . . . . . . . . . . . . . . . . . . . *Tyromyces* Karst.

## Key to species of *Bondarzewia*

1. Upper surface of basidiocarps yellowish to tan; basidiospores 7-8 x 6-7 μm

*Bondarzewia berkeleyi* (Fr.) Bond. et Sing. Basidiocarps with one to several pilei; upper surface often radiately rugose or pitted, sometimes obscurely zoned; pore surface whitish, discoloring on drying; pores unequal, sometimes lacerated or toothed. White rot on 7 in CA, BC.

1. Upper surface of basidiocarps purplish brown; basidiospores 6-7 x 5-6 μm

*Bondarzewia montana* (Quél.) Sing. Basidiocarps usually with a single pileus; upper surface covered with velvety pubescence; context white, spongy, drying hard; pore surface whitish, drying darker; pores 1-2 per mm. On 7 in BC.

## Key to species of *Coriolellus*

1. Context and pore surface whitish; pores not appearing hexagonal 2
1. Context and pore surface brown; pores appearing hexagonal

*Coriolellus carbonarius* (Berk. et Curt.) Bond. Basidiocarps effused-reflexed, sessile, or resupinate; upper surface light brown; pores 2-3 per mm; hyphal system dimitic, generative hyphae with clamps; basidiospores allantoid, 7-9 x 2.5-3 μm. Brown rot on 2 in AZ.

2. Basidiocarps usually resupinate . . . . . . . . . . . . . 3
2. Basidiocarps usually sessile or effused-reflexed . . . . 4

3. Pores large, often up to 2 mm in diam

*Coriolellus alaskanus* (Baxter) comb. nov. (basionym: *Trametes alaskana* Baxter, Mich. Acad. Sci. Arts, Lett. Papers 27:150. 1942). Basidiocarps creamy white when fresh, drying cream to buff; hyphal system trimitic, generative hyphae with clamps; basidiospores cylindric, 7-8 x 2.5-3 µm. Brown rot on 3 in AK; 7 in AK.

3. Pores small, 2-5 per mm

*Coriolellus serialis* (Fr.) Murr. Upper surface of basidiocarps cream colored or drying to buff; taste bitter anise; pore surface ivory; hyphal system trimitic, generative hyphae with clamps; basidiospores cylindric, 8-11 x 2.5-4 µm. Brown rot on 2 in AT, AZ, BC, CO, ID, MT, UT: 3 in AK, AT, BC, NWT, QB, SK, YT; 4 in AT, BC, MN, NF, NWT, QB; 5 in CO; 6 in CT, ME, NH, NY, PA; 7 in AK, BC, OR, QB, WA; 9 in AT, MN.

4. Basidiospores mostly more than 10 µm long . . . . . . . . 5
4. Basidiospores 7-10 µm long

*Coriolellus variiformis* (Pk.) Sarkar. Upper surface of basidiocarps reddish brown; pore surface white to ivory; pores angular, often becoming daedaloid, 1-2 per mm; hyphal system trimitic, generative hyphae with rare clamps; basidiospores cylindric to ellipsoid, 7-10 x 3-4 µm. Brown rot on 2 in BC, ID, MT, UT; 3 in AK, AT, BC, MB, MN, SK, YT; 4 in MN; 6 in ME, NB, NF, NH, NY, QB, OT, VT; 7 in AK, BC, WA; 9 in AT, NB, NS.

5. Basidiospores 12-14 µm long; pores 1-3 mm in diam

*Coriolellus heteromorphus* (Fr.) Bond. et Sing. Upper surface of basidiocarps ivory white to pale brownish; pore surface ivory white; hyphal system dimitic, generative hyphae with clamps; basidiospores cylindric, curved near the apiculus, 12-14 x 4-5 µm. Brown rot on 2 in AT, BC, CO, ID; 3 in AK, AT, BC, NB, NS, NWT, YT; 4 in AT, NF, NS; 6 in CT, ME, NH, NY: 7 in AK, BC, WA: 9 in BC, NS.

5. Basidiospores 8-12 µm long; pores 1-2 per mm

*Coriolellus sepium* (Berk.) Murr. Upper surface of basidiocarps almost white or often pale tan to gray; pore surface pale tan; hyphal system dimitic; generative hyphae with clamps; basidiospores cylindric, 8-12 x 2.5-4 µm. Brown rot on 3 in AK, YT; 6 in CT, ME, NH, NY; 7 in OR; 9 in AT.

## Key to species of *Coriolus*

1. Upper surface of basidiocarps distinctly zonate with multicolored zones; upper context separated from lower context by a thin dark layer

*Coriolus versicolor* (L. ex Fr.) Quél. Basidiocarps thin, sessile, effused-reflexed, or imbricate; zones in shades of gray, blue, reddish brown, and tan; pore surface white to buff; hyphal system trimitic, generative hyphae with clamps; basidiospores cylindric, slightly curved, 5.5-6 x 1.5-2 μm. White rot on 2 in ID, OR, WA; 6 in CT, ME, NH, NY; 7 in AK, CA, OR, WA; 9 in NB, PA.

1. Upper surface of basidiocarps azonate; upper context not separated from lower context by a thin dark layer

*Coriolus pubescens* (Schwm. ex Fr.) Quél. Basidiocarps sessile, dimidiate, often imbricate; upper surface whitish to yellowish; pore surface whitish; hyphal system trimitic, generative hyphae with clamps; basidiospores cylindric, slightly curved, 4.5-7.5 x 2-3 μm. White rot on 2 in MT; 3 in BC.

### Key to species of *Fomitopsis*

1. Context and pore surface rose colored . . . . . . . . . . . . 2
1. Context and pore surface white or pale buff, not rose colored . 3
    2. Basidiocarps usually ungulate; basidiospores straight, 5-8 x 2-3 μm

*Fomitopsis rosea* (Alb. et Schw. ex Fr.) Karst. Upper surface of basidiocarps rose colored at first, becoming purplish brown to blackish, frequently covered by a rimose crust; hyphal system dimitic, generative hyphae with clamps; basidiospores oblong-ellipsoid to subcylindric. Brown rot on 2 in AZ, BC, CO, ID, MT, NM, UT; 3 in AK, BC, NB, NWT, OT, QB, SK, YT; 4 in MN, NB; 5 in CO; 6 in CT, ME, NB, NH, NS, NY; 7 in WA; 9 in MN, NB, NS, NY, PA, PEI.

    2. Basidiocarps usually applanate; basidiospores curved, 5-8 x 1.5-2.5 μm

*Fomitopsis cajanderi* (Karst.) Kotl. et Pouz. Basidiocarps sessile or somewhat effused-reflexed, occasionally imbricate; upper surface sometimes sulcate, brownish pink, grayish to blackish in older parts; hyphal system dimitic; generative hyphae with clamps. White rot on 2 in AT, AZ, BC, ID, MT; 3 in AT, BC, NB, NS, MB, NH, SK, NWT; 4 in AT, MN, NB, OT; 6 in NB, NY; 7 in OR, WA; 9 in MN, NB, NS, NY, PA, PEI.

3. Context tough-corky; tissue not bitter . . . . . . . . . . . . 4
3. Context chalky and crumbly; tissue bitter

*Fomitopsis officinalis* (Vill. ex Fr.) Bond. et Sing. Basidiocarps ungulate to columnar; upper surface white to buff, becoming rimose; pore surface whitish; hyphal system dimitic; generative hyphae with clamps; gloeoplerous hyphae present; basidiospores ovoid, 4-7 x 3-3.5 μm. Brown rot on 2 in BC, ID; 4 in MN; 7 in AK, BC, OR, WA.

4. Basidiocarps usually sessile, applanate to ungulate; generative hyphae with clamps; basidiospores cylindric

*Fomitopsis pinicola* (Swartz ex Fr.) Karst. Upper surface of basidiocarps brownish, blackish, or reddish, often with a bright reddish, resinous margin; pore surface cream colored; hyphal system dimitic; cystidia hyphoid; basidiospores 6.5-7.5 x 3-4 µm. Brown rot of 2 in AZ, BC, CO, ID, MT, OR, UT, WY; 3 in AK, AT, BC, MB, NS, NWT, OT, SK, YT; 4 in MN, NB, NS, NWT, OT, QB, WS; 5 in CO; 6 in CT, ME, NB, NH, NS, NY, TN; 7 in AK, BC, OR, WA; 9 in BC, NB, NS, NWT, PEI.

4. Basidiocarps usually resupinate or effused-reflexed, rarely sessile; generative hyphae simple-septate; basidiospores subglobose

*Fomitopsis annosa* (Fr.) Karst. Upper surface of basidiocarps crustlike, brownish with age, indistinctly zonate and sulcate; pore surface cream colored; hyphal system dimitic; basidiospores 4-4.5 x 3-4.5 µm. White pocket rot of 2 in ID, NM, OR, WA; 3 in BC, MN; 6 in ME, VT; 7 in AK, BC, CA, OR, WA.

### Key to species of *Ganoderma*

1. Basidiocarps annual, context pale brownish to ivory; upper surface usually appearing varnished . . . . . . . . . . . . . . . . . 2
1. Basidiocarps perennial; context purplish brown to reddish brown; upper surface usually dull

*Ganoderma applanatum* (Pers. ex Wallr.) Pat. Basidiocarps sessile, usually applanate; upper surface usually grayish or grayish black, covered with a hard crust; pore surface white, darkening quickly on bruising; hyphal system trimitic; generative hyphae with clamps; basidiospores ellipsoid, truncate at one end, 6.5-8.5 x 4.5-6 µm. White mottled rot of 2 in ID; 3 in BC; 7 in AK, BC, CA, WA; 9 in NS.

2. Pileus not more than 5 cm thick; basidiospores 9-11 x 6-8 µm

*Ganoderma tsugae* Murr. Basidiocarps up to 30 cm wide, often centrally to laterally stipitate; tube layers up to 1 cm thick. White rot of 9 in NS.

2. Pileus typically 7-12 cm thick; basidiospores 10-16 x 7-9 µm

*Ganoderma oregonense* Murr. Basidiocarps becoming .75 m or more wide, usually sessile; tube layers up to 2 cm thick. White rot of 7 in AK, BC, OR, WA.

### Key to species of *Gloeophyllum*

1. Upper surface of basidiocarps usually zonate, often with bright yellowish or reddish brown zones; context often up to 3-4 mm thick

*Gloeophyllum saepiarium* (Wulf. ex Fr.) Karst. Basidiocarps effused-reflexed to sessile, occasionally resupinate; hyphal system dimitic, generative hyphae with clamps; cystidia cylindric, smooth or sparsely incrusted; basidiospores cylindric, 8-11 x 3-3.5 µm. Brown rot on 2 in AT, AZ, CO, ID, MT, NM, VT, WA, WY; 3 in AK, AT, BC, ME, NB, NS, NY, NWT, OT, PEI, VT, YT; 4 in AT, BC, MN, NB, NY, NWT, OT; 5 in AZ; 6 in CT, ME, NH, NS, NY; 7 in AK, BC, OR, WA; 9 in AT, NB, NF, NS, PEI.

1. Upper surface of basidiocarps azonate or indistinctly zonate, dull brown; context seldom more than 1 mm thick

*Gloeophyllum trabeum* (Pers. ex Fr.) Murr. Basidiocarps sessile, effused-reflexed, or sometimes resupinate; hyphal system dimitic, generative hyphae with clamps; cystidia cylindric, smooth; basidiospores cylindric, 7.5-9 x 3-3.5 µm. Brown rot on 6 in CT, ME, NH, NY; 9 in NY, PA.

### Key to species of *Hirschioporus*

1. Hymenophore poroid or becoming hydnaceous

*Hirschioporus abietinus* (Dicks. ex Fr.) Donk. Basidiocarps usually effused-reflexed, sometimes sessile or resupinate; pilei solitary or imbricated; upper surface grayish, hirsute; context duplex, upper layer whitish, soft, lower layer buff, corky; hyphal system dimitic, generative hyphae with clamps; basidiospores cylindric, 6-7.5 x 2.5-3 µm. White rot on 2 in AZ, CO, ID, MT, OR, VT, WA, WY; 3 in AK, AT, BC, ME, NB, NS, NWT, OT, PEI, YT; 4 in NB, NF, NS, NWT, OT, PEI, QB; 6 in CT, ME, NB, NH, NS, NY, PA; 7 in AK, BC, WA; 9 in BC, NB, NS, OT, PEI.

1. Hymenophore strongly lamellate

*Hirschioporus laricinus* (Karst.) Teramoto. Basidiocarps effused-reflexed or resupinate; upper surface tan to gray, hirsute, faintly zonate; context pale purplish brown; hyphal system dimitic, generative hyphae with clamps; basidiospores allantoid, 6-7 x 2-2.5 µm. White rot on 6 in NY.

### Key to species of *Phaeolus*

1. Basidiocarps effused-reflexed or resupinate; pore surface and context bright orange . . . . . . . . . . . . . . . . . . . . 2
1. Basidiocarps stipitate to sessile; context brownish; pore surface greenish-brown when fresh

*Phaeolus schweinitzii* (Fr.) Pat. Pilei solitary or imbricate, circular or irregularly lobed; upper surface yellowish brown when fresh, drying to dark reddish brown, tomentose to hirsute, faintly zonate; hyphae simple-septate, brownish in KOH solution; cystidia cylindric, yellowish; basidiospores ellipsoid to ovoid, 6-9 x 3.5-5 µm. Brown cubical root and butt rot on 2 in AZ, ID, MT, OR; 3 in BC, MB, NB, NS, NWT, OT; 4 in MN, OT; 6 in MA, ME, NY, VT; 7 in AK, BC, CA, OR, WA; 9 in NB, NS, PEI.

2. Pores 1 mm or more in diam; basidiospores 10-14 μm long

*Phaeolus alboluteus* (Ell. et Ev.) Pilát. Basidiocarps effused-reflexed or commonly resupinate, often effused for several feet, developing in early spring in snow and deteriorating rapidly after snow melts; upper surface soft and spongy; hyphae simple-septate; cystidia abundant, cylindric, projecting up to 80 μm; basidiospores cylindric, 10-14 x 3-4 μm. Brown rot on 2 in AZ, BC, CO, ID, MT, OR, UT, WA, WY; 3 in AK, BC; 4 in MI, 5 in AZ; 6 in NY; 7 in AK, BC, WA; 9 in AT.

2. Pores 2-3 per mm; basidiospores 5-6 μm long

*Phaeolus fibrillosus* (Karst.) Bourd. et Galz. Basidiocarps usually pileate; hyphae simple-septate; cystidia not abundant, cylindric; basidiospores oblong-ellipsoid, 4-5 x 2.5-3 μm. Brown rot on 2 in ID, MT, OR; 3 in AK, BC; 4 in MN; 6 in NC, NY; 7 in AK, BC, OR, WA; 9 in NC.

## Key to species of *Polyporus*

1. Hyphal system dimitic or trimitic; surface of basidiocarps not hispid or scurfy . . . . . . . . . . . . . . . . . . . . . . 2
1. Hyphal system monomitic; upper surface of basidiocarps grayish to purplish brown, usually hispid or scurfy

*Polyporus hirtus* Quél. Pores 1-2 per mm; hyphal system monomitic; hyphae thin-walled, abundantly nodose-septate; basidiospores fusiform, 13-17 x 4.5-5.5 μm. White rot of 2 in AZ; 3 in BC; 6 in NF; 9 in AZ.

2. Upper surface of basidiocarps ochraceous to dark chestnut brown, not striate . . . . . . . . . . . . . . . . . . . . . . 3
2. Upper surface of basidiocarps pale brownish with light colored radial striations

*Polyporus varius* Pers. ex Fr. Basidiocarps centrally to laterally stipitate, up to 10 cm wide; basidiospores 7-12 x 3-4 μm. White rot of 2 in ID; 3 in AT.

3. Basidiocarps lignicolous, on wood above ground; upper surface glabrous . . . . . . . . . . . . . . . . . . . . . . . . . . 4
3. Basidiocarps terrestrial, on buried wood; upper surface finely velvety

*Polyporus melanopus* Fr. Basidiocarps centrally stipitate; stipe velvety above black base; basidiospores 8-12 x 3.5-4 μm. White rot of 2 in MT.

4. Upper surface of basidiocarps pale tan to dull tan, weathering to white

*Polyporus elegans* Bull. ex Fr. Basidiocarps centrally to laterally stipitate, up to 5 cm wide; basidiospores 6-10 x 2.5-3.5 μm. White rot of 3 in AT, BC; 9 in NWT.

4. Upper surface of basidiocarps light chestnut brown to blackish

*Polyporus picipes* Fr. Basidiocarps centrally to laterally stipitate, often lobed or imbricate and growing in clusters, up to 15 cm wide; basidiospores 6-8 x 3-4 µm. White rot of 7 in AK, BC.

### Key to species of *Poria*

1. Hyphal system monomitic . . . . . . . . . . . . . . . . . . . . 2
1. Hyphal system dimitic or trimitic . . . . . . . . . . . . . . . 20
    2. Hyphae with clamp connections . . . . . . . . . . . . . . . 3
    2. Hyphae simple-septate . . . . . . . . . . . . . . . . . . . 13
3. Pore surface lavender or yellow . . . . . . . . . . . . . . . . 4
3. Pore surface white to cream colored . . . . . . . . . . . . . . 5
    4. Margin with yellow rhizomorphs; pore surface pale yellow

*Poria albolutescens* (Rom.) Egeland. Basidiospores oval to ellipsoid, 3.5-5 x 2.5-3 µm, amyloid in Melzer's reagent. Brown rot of 2 in CO.

4. Margin not rhizomorphic; pore surface variable in color, lavender to pale yellow

*Poria bombycina* (Fr.) Cke. Basidiospores broadly ellipsoid, 5-8 x 3-5 µm, weakly amyloid in Melzer's reagent. Brown rot of 2 in CO; 9 in AT, BC.

5. Basidiospores ellipsoid to subglobose . . . . . . . . . . . . . 6
5. Basidiospores cylindrical . . . . . . . . . . . . . . . . . . . 10
    6. Basidiocarps not rhizomorphic . . . . . . . . . . . . . . . 7
    6. Basidiocarps rhizomorphic . . . . . . . . . . . . . . . . . 9
7. Basidiospores hyaline; spore print white . . . . . . . . . . . 8
7. Basidiospores becoming brown at maturity; spore print brown

*Poria incrassata* (Berk. et Curt.) Burt. Pore surface buff, becoming grayish brown in drying; basidiospores narrowly to broadly ellipsoid, negative in Melzer's reagent, 7-13 x 4.5-6.5 µm. Brown rot of 9 in NB.

8. Capitately incrusted cystidia present

*Poria sericeomollis* (Rom.) Egeland. Basidiospores oblong to cylindric-ellipsoid, 4-5 x 2.2.5 µm; taste bitter. Brown cubical rot of 2 in BC, MT; 3 in BC; 6 in NB; 7 in BC.

8. Capitately incrusted cystidia not present

*Poria rivulosa* (Berk. et Curt.) Cke. Fusoid cystidioles present; basidiospores ovoid to subglobose, 4.5-6 x 3.5-5 µm. White laminated rot of 3 in BC; 7 in BC.

9. Basidiospores amyloid in Melzer's reagent, oblong to ovoid, 3-5 x 2.5-3.5 µm

*Poria myceliosa* Pk. Pores angular, 1-4 per mm. White rot of 5 in CO; 7 in BC.

9. Basidiospores negative in Melzer's reagent, ovoid to subglobose, 2.5-3.5 x 2-2.5 µm

*Poria mollusca* (Pers. ex Fr.) Cke. Pores circular to daedaloid, usually 4-7 per mm. White rot of 7 in BC.

10. Basidiospores allantoid, 1-1.5 µm wide . . . . . . . . . . 11
10. Basidiospores straight, 2-3 µm wide . . . . . . . . . . 12
11. Cystidia lacking

*Poria subvermispora* Pilát. Pore surface white to cream colored; pores 2-4 per mm; tubes drying brittle; taste bitter. Brown rot of 2 in CO.

11. Capitately incrusted cystidia present in hymenium

*Poria simani* (Pilát) Gilbn. et Lowe. Pore surface cream colored; tubes drying soft and fragile; cystidia cylindric, 3-4 µm in diam. Brown rot of 9 in AZ.

12. Basidiospores 7-11 x 2-3 µm

*Poria mappa* Overh. et Lowe. Basidiocarps often less than 1 mm thick; pore surface cream colored; pores 3-4 per mm. White rot of 4 in AK.

12. Basidiospores 4-6 x 2-2.5 µm

*Poria monticola* Murr. Basidiocarps up to 3 mm thick; pore surface cream colored to buff; pores 2-4 per mm. Brown cubical rot of 2 in CO, ID; 7 in BC, OR.

13. Pore surface pinkish brown, rose colored or dark purplish . . . 14
13. Pore surface white to cream colored . . . . . . . . . . . . . . . 18
14. Basidiocarps thin, soft; basidiospores narrowly allantoid or cylindric-ellipsoid . . . . . . . . . . . . . . . . . . . . 15
14. Basidiocarps thin to thick; basidiospores ovoid to subglobose . . . . . . . . . . . . . . . . . . . . . . . . . 16
15. Pore surface rose colored; tube layer not distinctly separated from subiculum; basidiospores cylindric-ellipsoid

*Poria tarda* (Berk.) Cke. Tubes arising as isolated cupules; subicular hyphae thin-walled, 3-6 µm in diam; basidiospores 4-5 x 2-2.5 µm. White rot of 3 in BC.

15. Pore surface becoming purple; tube layer purple, distinctly separated from white, cottony subiculum, basidiospores narrowly allantoid

*Poria taxicola* (Pers. ex Fr.) Bres. Tubes often developing in scattered areas over a white subiculum; hymenium continuous over edges of dissepiments; cylindric cystidioles present; basidiospores 4-6 x 1-1.5 µm. White rot of 2 in CO, ID, WA.

16. Basidiocarps not rhizomorphic, drying horny; pores 4-8 per mm . . . . . . . . . . . . . . . . . . . . . . . . 17
16. Basidiocarps rhizmorphic, drying soft and byssoid; pores 2-3 per mm

*Poria terrestris* (DC ex Fr.) Cke. Pore surface yellow, pinkish or blue; some clamp connections present but most hyphae simple-septate; basidiospores 4-5 x 3-4 µm. Undetermined rot of 2 in AZ; 3 in AT; 9 in AT.

17. Basidiocarps white, drying pinkish; basidiospores 5-6 x 4-5 µm

*Poria vitrea* (Pers. ex Fr.) Cke. Basidiocarps annual; basidia 12-17 x 5-7 µm; basidiospores 5-6 x 4-5 µm. White pocket rot of 9.

17. Basidiocarps pinkish, drying pale brown to dark blackish brown; basidiospores 4-5.5 x 3-4 µm

*Poria nigrescens* Bres. Basidiocarps perennial; basidia 17-20 x 10-12 µm; basidiospores 3.5-5 x 3.5-5 µm. White stringy rot of 7 in BC.

18. Incrusted cystidia present; basidiospores broadly ellipsoid to ovoid . . . . . . . . . . . . . . . . . . . . . . . . 19
18. Cystidia lacking; basidiospores allantoid

*Poria reticulata* (Pers. et Fr.) Cke. Basidiocarps thin, annual, usually effused in small patches; hymenial surface cupulate at first; basidiospores 7-9.5 x 2-3.5 µm. White rot of 2 in CO; 7 in WA.

19. Basidiospores ovoid to broadly ellipsoid, 5-9 x 3-4 µm

*Poria corticola* (Fr.) Cke. Pores 1-3 per mm; subicular hyphae thin- to thick-walled, 2-5 µm in diam. White rot of 8 in CH.

19. Basidiospores ovoid to broadly ellipsoid, 4-5 x 2.5-3 µm

*Poria similis* Bres. Pores 4-6 per mm; subicular hyphae thin- to thick-walled, 2-4 µm in diam. White rot of 7 in BC.

20. Thick-walled, incrusted skeletocystidia present . . . . 21
20. Cystidia absent, cystidioles present in some species . . 24
21. Basidiospores ellipsoid to subglobose . . . . . . . . . . . 22
21. Basidiospores cylindric . . . . . . . . . . . . . . . . . . 23
22. Basidiocarps rhizomorphic; pores 2-5 per mm

*Poria radula* (Pers. ex Fr.) Cke. Pore surface cream colored to pale buff; generative hyphae with clamps; basidiospores 3.5-4 x 2-3 µm. White rot of 6 in ME.

22. Basidiocarps not rhizomorphic; pores 6-8 per mm

*Poria eupora* (Karst.) Cke. Pore surface pinkish buff to vinaceous; generative hyphae with clamps; basidiospores 4-4.5 x 2-2.5 µm. White rot of 6 in NY.

23. Pore surface cream colored

*Poria luteoalba* (Karst.) Sacc. Subiculum cream colored to pale buff; generative hyphae with clamps; basidiospores cylindric, straight or slightly curved, 4-6 x 1.5-2 µm. White pitted and laminated rot of 6 in NH; 9 in QB.

23. Pore surface brownish pink

*Poria rixosa* (Karst.) Karst. Subiculum pinkish buff; generative hyphae with clamps; basidiospores allantoid, 4-6 x 1.5-2 µm. White laminated rot of 2 in MT; 3 in BC, OT, SD; 4 in MN; 6 in NH, NY; 9 in NY.

24. Basidiospores subglobose to ellipsoid . . . . . . . . . . 25
24. Basidiospores oblong to cylindric, straight or allantoid . . . . . . . . . . . . . . . . . . . . . . . . . 26
25. Basidiocarps perennial, tough-fibrous, pore surface yellowish

*Poria subacida* (Pk.) Sacc. Hyphal system trimitic; tramal and subicular tissue dextrinoid in Melzer's reagent; generative hyphae with clamps, slender binding hyphae abundant, 1-2 µm in diam; basidiospores 4.5-6.5 x 3-4.5 µm; cream colored to golden yellow mycelial felts present in decayed wood. White stringy rot of 2 in ID, MT, OR, WA; 3 in BC, ME, NB, OT; 4 in MB, NF, NS, OT; 6 in CT, ME, NB, NH, NS, NY, VT; 7 in AK, BC, OR, WA; 9 in AK, NS.

25. Basidiocarps annual, tubes and subiculum soft; pore surface white to cream colored

*Poria vaillantii* (DC. ex Fr.) Cke. Margin often with white rhizomorphs; hyphal system dimitic; generative hyphae with clamps; basidiospores 5-8 x 3-4 µm. Brown cubical rot of 7 in WA.

26. Basidiospores cylindric, straight or allantoid . . . . . 27
26. Basidiospores oblong, 3.5-4 x 2-2.5 µm

*Poria romellii* Donk. Basidiocarps annual; pore surface cream colored to pale buff, the pores 6-8 per mm; hyphal system dimitic, generative hyphae with clamps; hyphal pegs present. White rot of 2 in CO; 3 in NWT; 9 in AT.

27. Subiculum uniform in color . . . . . . . . . . . . . . . . . 28
27. Subiculum cream colored to buff with a dark brown layer next to the substratum

*Poria albobrunnea* (Rom.) Baxt. Pore surface white to cream colored, becoming reddish brown on age or drying; hyphal system dimitic; generative hyphae with clamps; basidiospores allantoid, 5-7 x 1.5-2 µm. Brown cubical rot of 3 in AK, YT; 7 in OR.

28. Pore surface bright yellow, sometimes fading on age or drying . . . . . . . . . . . . . . . . . . . . . . . . . 29
28. Pore surface white to cream colored or buff, never bright yellow . . . . . . . . . . . . . . . . . . . . . 30
29. Basidiocarps perennial; pores about 1-5 per mm

*Poria alpina* Litsch. Subiculum chalky when dry, up to 2 mm thick tube layer up to 1.5 cm thick. Brown cubical rot of 2 in MT; 3 in AT.

29. Basidiocarps annual; pores 5-7 per mm.

*Poria xantha* (Fr.) Cke. Subiculum chalky when dry, up to 3 mm thick; tube layer up to 3 mm thick. Brown cubical rot of 2 in MT; 3 in AK, AT, BC, NF, NWT, YT; 4 in AK, NWT; 6 in ME; 7 in BC; 9 in AT, BC.

30. Basidiospores cylindric, straight or allantoid; basidiocarps firm . . . . . . . . . . . . . . . . . . . . . . 31
30. Basidiospores lunate; basidiocarps soft, byssoid

*Poria lenis* (Karst.) Sacc. Basidiocarps annual, pores often sinuous in age, 4-7 per mm; basidiospores 3.5-4.5 x 1-1.5 µm. White rot of 2 in ID, MT; 3 in AK; 7 in AK, CA, OR; 9 in MN.

31. Hyphae at dissepiment edges incrusted . . . . . . . . . . . . 32
31. Hyphae at dissepiment edges not incrusted . . . . . . . . . . 33
32. Basidiocarps perennial, becoming thick

*Poria stellae* Pilát. Pores 5-7 per mm; margin fimbriate; fusoid cystidioles present; basidiospores allantoid, 4.5-6 x 0.7-1 µm. White rot of 2 in CO, MT; 4 in NF; 9 in AT, BC.

32. Basidiocarps annual, thin

*Poria subincarnata* (Pk.) Murr. Pore surface creamy white with pinkish cast when fresh; margin fimbriate or sometimes rhizomorphic; fusoid cystidioles present; basidiospores allantoid, 4-6.5 x 1-1.5 µm. White rot of 2 in AT, AZ; 3 in AK, AT, BC; 4 in AT; 7 in BC; 9 in AT, NS.

33. Pore surface cream colored to buff . . . . . . . . . . . . . 34
33. Pore surface becoming cinereous

*Poria cinerascens* (Bres.) Sacc. et Syd. Basidiocarps annual, tough-fibrous; hyphal system trimitic; hyphal pegs present; basidiospores cylindric, slightly curved, 5-7 x 1.5-2 µm. White rot of 2 in AT, AZ, MT, OR; 3 in AK; 6 in CT, ME, NH, NY; 7 in AK; 9 in AT, MN, NS.

34. Basidiospores straight or narrowly allantoid . . . . . . 35
34. Basidiospores broadly allantoid

*Poria crustulina* Bres. Basidiocarps annual; pores angular, 3-4 per mm; hyphal pegs present; basidiospores 7-8 x 2.5-3 µm. White rot of 2 in AZ, BC, CO, ID, MT, WA, WY; 3 in AK, AT, BC, NWT, YT; 4 in AK, NF, NS; 6 in NS; 7 in AK, MT, WA; 9 in NS, BEI.

35. Pores 2-3 per mm . . . . . . . . . . . . . . . . . . . . . . 36
35. Pores 4-6 per mm . . . . . . . . . . . . . . . . . . . . . . 37
  36. Basidiospores 4-5.5 x 1.5-2 µm, allantoid

*Poria sinuosa* (Fr.) Cke. Basidiocarps annual; pores 2-4 per mm. Brown cubical rot of 2 in AZ, CO, MT; 3 in AK, BC; 4 in NS.

  36. Basidiospores 5-5.5 x 2-2.5 µ, short-cylindric to oblong, straight

*Poria carbonica* Overh. Basidiocarps annual, tough-corky; pores 3-5 per mm; tube layer up to 1 cm thick; hyphal system trimitic; skeletal hyphae amyloid in Melzer's reagent. Brown cubical rot of 2 in AZ, ID; 7 in BC.

37. Basidiospores cylindric to oblong . . . . . . . . . . . . . 38
37. Basidiospores narrowly allantoid

*Poria odora* (Pk.) Sacc. Basidiocarps annual, drying cartilaginous; strong garlic like odor from fresh basidiocarps and rot; pores 4-6 per mm; fusoid cystidioles present; basidiospores 5-6.5 x 1-1.5 µm. Brown rot of 3 in AK, YT.

  38. Basidiocarps chalky; margin not distinctive

*Poria oleagina* Overh. Basidiocarps perennial; becoming crumbly, chalky; pores 4-6 per mm; fusoid cystidioles present; basidiospores short cylindric to oblong, 3.5-5 x 1.5-2 µm. Brown cubical rot of 4 in MN; 7 in BC; 9 in MN.

  38. Basidiocarps cheesy; margin often reddish and resinous

*Poria sitchensis* Baxt. Basidiocarps annual; with strong sweet odor when fresh; pores 4-7 per mm; taste resinously bitter; tramal hyphae weakly amyloid in Melzer's reagent; fusoid cystidioles present; basidiospores 4-5 x 1.5-2 µm. Brown cubical rot of 2 in MT; 4 in AT; 7 in AK, CA, OR.

### Key to species of *Tyromyces*

1. Hyphal system of context or trama dimitic or trimitic; associated with white rot . . . . . . . . . . . . . . . . . . . 2
1. Hyphal system monomitic; associated with brown rot . . . . . . . 4
  2. Skeletal hyphae present in trama; context monomitic . . . 3
  2. Skeletal hyphae present in context

*Tyromyces semipileatus* (Pk.) Murr. Basidiocarps resupinate, effused-reflexed, or sessile; upper surface white or cinereous when fresh, drying grayish to yellowish; pore surface white to cream colored, glancing; pores 8-10 per mm; basidiospores allantoid, 3-4 x 0.5-1 µm. White rot on 9 in OT.

3. Basidiospores allantoid; usually on hardwoods, rarely on conifers

*Tyromyces albellus* (Pk.) Bond. et Sing. Basidiocarps sessile or effused-reflexed; upper surface white, becoming yellowish to light gray, pellicular; pore surface white to pale buff, glancing; pores 6-7 per mm; basidiospores allantoid, 4-6 x 1.5-2.5 µm. White rot of 4 in NB.

3. Basidiospores broadly ovoid to subglobose; known only on conifers

*Tyromyces canadensis* (Overh.) Lowe. Basidiocarps usually sessile; upper surface white to mousy gray; pore surface white to light buff; pores 6-9 per mm; basidiospores 2.5-3.5 x 2-2.5 µm. White rot of 3 in MN.

4. Hyphae with clamp connections . . . . . . . . . . . . . . . 5
4. Hyphae simple-septate

*Tyromyces mollis* (Pers. ex Fr.) Kotl. et Pouz. Basidiocarps sessile, effused-reflexed or resupinate; upper surface pale purplish brown, glabrous, becoming rugose; pore surface pale pinkish brown, basidiospores allantoid, 4.5-5.5 x 1- 1.5 µm. Brown rot of 2 in AZ; 3 in AT.

5. Basidiospores negative in Melzer's reagent . . . . . . . . . . 6
5. Basidiospores dextrinoid in Melzer's reagent

*Tyromyces kravtzevianus* Bond. et Parm. in Parm. Basidiocarps narrowly reflexed or often resupinate; upper surface whitish, becoming blotched with reddish brown on drying; basidiospores ellipsoid to short-cylindric, 5-6 x 2.5-3 µm. Brown rot of 4 in QB; 3 in SK; 9 in NB.

6. Cystidia lacking . . . . . . . . . . . . . . . . . . . . . 7
6. Fusoid cystidia present in hymenium

*Tyromyces balsameus* (Pk.) Murr. Basidiocarps sessile or effused-reflexed, solitary or imbricate, dimidiate or laterally fused and elongated; upper surface whitish to pale brownish, faintly zonate; pore surface whitish, becoming pale brownish on drying; cystidia numerous, often incrusted; basidiospores ovoid to ellipsoid, 3.5-4.5 x 2.5-3 µm. Brown rot of 2 in CO, ID; 3 in AT, BC, NB, OT; 4 in OT; 7 in AK, BC, WA; 9 in NS.

7. Basidiocarps white to rufescent, not with blue tints . . . . . 8
7. Basidiocarps whitish with a blue or grayish blue cast

*Tyromyces caesius* (Schrad. ex Fr.) Murr. Basidiocarps sessile or effused-reflexed, solitary, dimidiate or narrow and shelf-like; basidiospores cylindric to allantoid, 4.5-6 x 1-1.5 µm. Brown rot of 2 in AZ; 3 in AT, BC, CA, NWT, YT; 4 in AK; 6 in CT, ME, NH, NY; 7 in AK, CA; 9 in CA.

8. Basidiocarps without shallow, circular depressions on upper surface . . . . . . . . . . . . . . . . . . . . . . 9
8. Basidiocarps with shallow, circular depressions on upper surface

*Tyromyces guttulatus* (Pk.) Murr. Basidiocarps sessile to substipitate, dimidiate to flabelliform, applanate; upper surface white to pale buff; pore surface white to cream colored; tissues with a bitter taste; hyphae thin- to thick-walled, all with clamps; some thin-walled gloeoplerous hyphae with occasional distorted clamps also present; small fusoid cystidioles present; basidiospores short-cylindric, 4-5 x 2-2.5 µm. Brown rot of 3 in MN; 4 in MN; 7 in BC, WA; 9 in NY, PA, WA.

9. Tissue bitter tasting . . . . . . . . . . . . . . . . . . . . . 10
9. Tissue mild, without a bitter taste . . . . . . . . . . . . . . 11
    10. Upper surface of basidiocarps smooth, pellicular, cream colored to mousy gray

*Tyromyces tephroleucus* (Fr.) Donk. Basidiocarps sessile or effused-reflexed, dimidiate or flabelliform; pore surface white, becoming yellowish on drying; basidiospores cylindric to allantoid, 4-5 x 1-2 µm. Brown rot on 2 in AZ.

    10. Upper surface of basidiocarps usually rough, white, with small black spots

*Tyromyces immitis* (Pk.) Bond. Basidiocarps sessile or effused-reflexed, dimidiate; basidiospores cylindric-ellipsoid, 3.5-5 x 1.5-2 µm. Brown rot of 2 in ID; 3 in NWT, SK; 9 in AZ, MT, NB, OR.

11. Upper surface tomentose to glabrous . . . . . . . . . . . . . 12
11. Upper surface cottony, growing down over and partially enclosing pore surface

*Tyromyces leucospongia* (Cke. et Harkn.) Bond. et Sing. Basidiocarps effused-reflexed or sessile, dimidiate to elongate; upper surface white to pale buff, with a thick layer of soft, cottony tomentum; pore surface cream colored to pale buff; basidiospores allantoid, 4-5 x 1-1.5 µm. Brown rot of 2 in CO, ID, UT, WY; 9 in CA.

    12. Basidiocarps white to cream colored, not discoloring on bruising or drying . . . . . . . . . . . . . . . . . . 13
    12. Basidiocarps white to cream-colored, staining reddish brown on bruising or drying

*Tyromyces fragilis* (Fr.) Donk. Basidiocarps sessile or effused-reflexed, dimidiate or elongated; hyphal pegs present; basidiospores allantoid, 4-5 x 1.5-2 µm. Brown rot of 2 in AZ, ID; 4 in MN; 7 in WA; 9 in MN, NY, OR.

13. Basidiocarps with strongly undulate margins on reflexed portions; pores 2-3 per mm

    *Tyromyces undosus* (Pk.) Murr. Basidiocarps effused-reflexed or occasionally resupinate; upper surface whitish to pale buff; pore surface cream colored; basidiospores allantoid, 4-7 x 1-1.5 µm. Brown rot on 2 in AZ, MT; 6 in ME, NH, NY; 7 in BC, WA.

13. Basidiocarps with level margin on reflexed portions; pores 5-7 per mm

    *Tyromyces perdelicatus* Murr. Basidiocarps sessile or resupinate, dimidiate; upper surface white to light buff, tomentose; pore surface white to light buff; basidiospores cylindric, straight or slightly curved, 4-5.5 x 1-1.5 µm. Brown rot on 2 in AZ, MT.

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# A NEW NEPHROMA SPECIES FROM SOUTH AMERICA

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## SUMMARY

The new species *Nephroma (Nephromium) microphyllum* Henss. from Argentina is characterized by multiseptate acicular spores, squamuliform isidial lobes, moniliform tomentum hairs occuring on both sides of the thallus, and by a distinct pattern of secondary metabolites including phenarctin, usnic acid and several triterpenoids. The close relationship to *Nephroma kuehnemannii* M. Lamb and *Nephroma chubutense* M. Lamb is discussed. A new locality is given for *N.kuehnemannii,* and the pycnidia of this species are described.

## INTRODUCTION

*Nephroma microphyllum* Henss., a new South American species is closely related to *Nephroma kuehnemannii* M.Lamb (Lamb 1955, 1958) and differs from the latter by the presence of a blue-green phycobiont. We have collected both species in the Parque Nacional Lanin, Argentina. The *N. kuehnemannii* specimen possessed apothecia and pycnidia, which are not mentioned in the original diagnosis (Lamb 1955). Both species are characterized by multiseptate acicular spores, a unique structure within the genus and by distinct rhizines. A third species belonging to this group is *Nephroma chubutense* M. Lamb (Lamb 1955, 1958). This species only is known in sterile condition but is similar in its morphology and chemical properties.

## MATERIAL AND METHODS

Material studied. The abbreviations of herbaria follow the "Index Herbariorum".

*Nephroma chubutense:* Argentina, Chubut, Lago Menéndez, 1950, Lamb 5916 (UPS, isotype). - Chile, Llanquihue, Lago Todos Los Santos, 1974, Redon 03164 (MB, part of collection mentioned in Redon 1974). - *Nephroma kuehnemannii:* Argentina, Chubut, Lago Menêndez, 1941, Kühnemann 5485 (BA, holotype); - Neuquên, Parque Nacional Lanín, Lago Currhue, Arroyo de Escorial, at the border of a lava field on shady trunk of *Nothofagus dombeyi* at a river bank, c. 1000 m.s.m., 1973, Henssen & Vobis 24590c (MB).

Morphology. The freezing microtome sections were mounted in lactophenol/cotton-blue. Measurements of spores and anatomical structures were made from permanent prepared material; measurements of gross morphology on air-dried specimens.

Analysis of secondary metabolites. The lichen compounds were identified by quantitative isolation from thin-layer chromatograms followed by u.v./v.i.s. spectroscopy and electron-impact-mass spectroscopy (Renner & Gerstner 1978). The separation by TLC followed the method of Culberson (1972); used were the solvent systems A,B, and C; the two - directional separation was carried out on HPTCL-plates (5 x 5 cm).

## TAXONOMIC PART

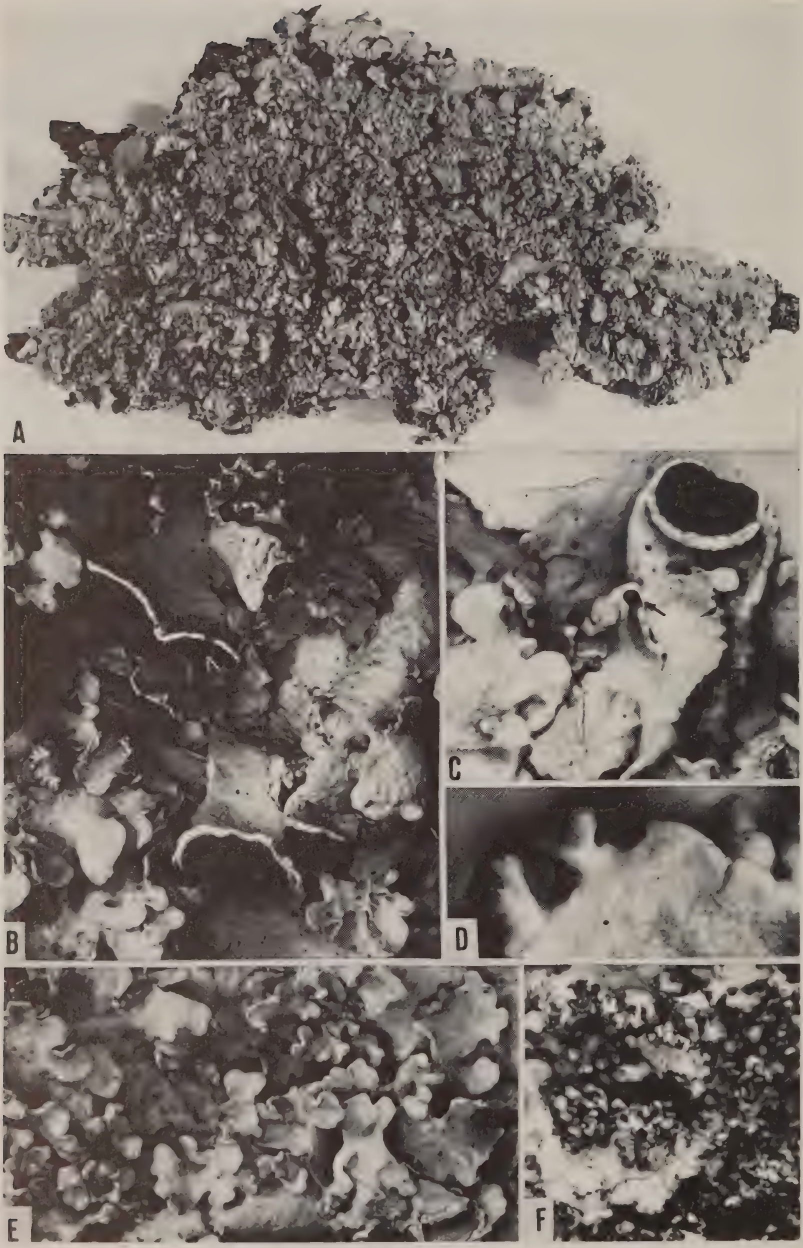
### *Nephroma microphyllum* Henss., sp.nov. Figs.1-3

Diagnosis. Thallus foliosus usque ad 15 cm latus, substrato adnatus, irregulariter laciniato-lobatus, superne griseo-olivaceus, pro parte reticulatus, glaber vel pubescens, inferne pallidus, tomento et rhizinis villoso-vestitus. Lobi 1-2 cm longi et 0.5-1 cm lati, marginibus varie incisis, undulatis, isidio-lobatis. Medulla albida 100 - 300 µm crassa; stratum corticale pseudoparenchymaticum, superne 30-40 µm crassum, inferne 8-15 µm crassum, tomento moniliformi. Apothecia terminalia, mox sese sursum revolventia, rotundata vel oblonga, usque ad 6 mm lata, disco obscure rufo-fusco; margo thallinus irregulariter incisus, cortex areolato-aspero. Hymenium 95-120 µm altum, hypothecium 45-50 µm altum, in iodo cyanescens. Acsi clavati, 5 (-8 ?) sporis, (7-)10-11.5 x 85-90(-105)µm. Sporae 5-8-septatae, incolores, (65-)70-90(-105) x 3-3.5 µm. Pycnidia fusca, marginalia vel submarginalia, mox composita et pedicellata, pro parte ramosa, usque ad 0.35-0,45 mm longa et 0.2 mm lata; conidia bacilliformia, 3-4 x 1 µm. Alga ad *Nostoc* pertinens.

Holotype: Argentina, Prov. Neuquén, Parque Nacional Lanîn, Lago Lacar, near forest station Pucara, W of Rio Nothué, on a dead lying trunk of *Nothofagus* at the side of a rivulet in a park-like stand of *Nothofagus* at c. 800 m.s.m., 1973, Henssen & Vobis 24574a (MB); isotype: BA. Paratype: three kilometers from the type-locality on the trunk of *Nothofagus dombeyi* growing beside a canal in a dense *Nothofagus-forest,* at c. 800 m.s.m., 1973, Henssen & Vobis 24572c (MB).

Thallus corticolous, grey-or blue-olive, expanding up to 15 cm or more, adnate to the substrate. Upper surface partly reticulate and/or provided with cracks, naked or with patches of moniliform hairs, occasionally with globular outgrowths of the cortex lower surface pale, covered to a great extent by whitish rhizines and a tomentum of moniliform hairs. Rhizines c. 0.3-1.2 mm and 0.06-0.4 mm broad; tomentum hyphae 20-60 µm long and c. 3.5 µm thick, often branched. Lobes irregularly branched, 1-2 cm long and 0.5-1 cm broad, undulated, incised and covered by flat partly imbricate isidial lobes. Isidial lobes incised of the same color as the thallus upper surface, c. 1 mm broad and gradually enlarging to form lobes.

Thallus sections (without hairs or isidia) 315-400 µm high. Upper cortex 30-40 µm thick, pseudoparenchymatous with an inner hyaline layer composed of anticlinal thin - walled hyphae 3-4 cells high with isodimetric cells and 5-9 µm large lumina, and an outer layer of two cell rows formed by periclinal hyphae with strongly gelatinizing walls and c. 6 µm long lumina; the outer part in older thalli brownish by interspersed lichen substances. Outer cortex cells partly developing into moniliform hairs of the same size and shape as the tomentum hairs of the lower surface, or growing out into globular structures. Algal layer 15-80 µm thick, interrupted by strands of medullary hyphae, *Nostoc* cells in clusters surrounded by distinct mucilage sheaths, round or slightly oblong, 5-8 µm in diam. Medulla white, 100-300 µm thick, composed of horizontally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interwoven c. 3-4 µm thick hyphae, in older parts of the thallus opaque and brownish by the numerous crystals deposited on the walls. Lower cortex c. 8-15 µm thick composed of 3-4 rows of cells arising from periclinal hyphae.

Apothecia sparse, terminal on small lobes, formed on the underside, and then reflexed to face partly upwards, disc round or oblong up to 6 cm diam., dark red-brown, surrounded by an incised thalline margin. Underside of apothecium corticated and areolate-verruculose; cortex a massively developed supporting tissue, 100-150 µm thick, composed of 8-15 or more rows of cells, with increasing gelatinization of the walls in outward direction; cell lumina correspondingly diminished from 12 to 4 µm. Hymenium 95-120 µm high, subhymenial layers 90-100 µm including a 45-50 µm thick hypothecium which stains blue in iodine. Asci clavate, containing 5(-8 ?) spores, 85-90 (-105) x (7-) 10-11.5 µm, outer gelatinous layer of the ascus wall amyloid. Spores colorless, acicular-cylindrical, 5-8-septate, with bluntly pointed ends or one end tapering, (65-) 70-90 (-105) x 3-3.5 µm, packed ± straight and parallel.

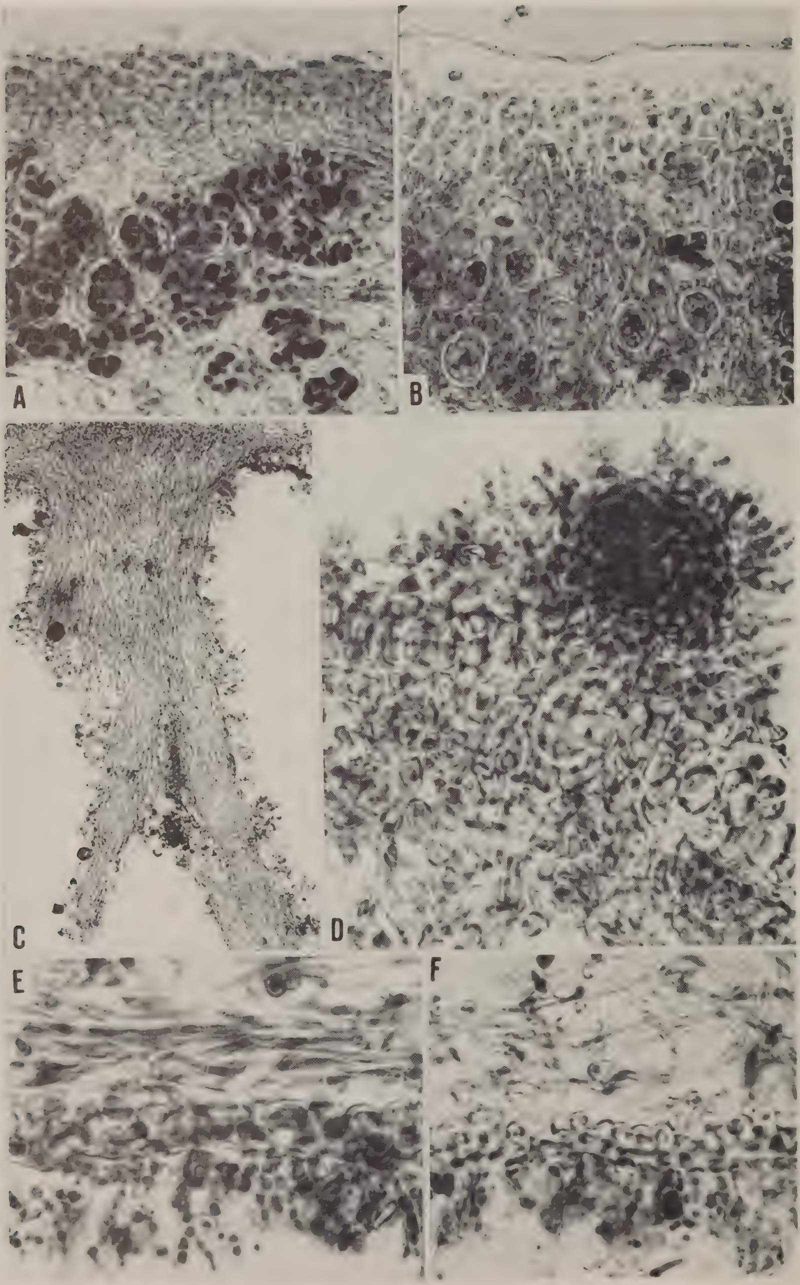
Pycnidia brown, pedicellate and often branched, 0.2 mm broad and finally 0.35-0.45 mm long, with brown tip, composed of basal older and apical younger parts. Conidiophores articulate and branched (*Sticta*-type), conidia rod-shaped, c. 3-4 x 1 µm.

Chemistry: phenarctin, usnic acid, four triterpenoids, four unknown minor constituents.

The name *microphyllum* is chosen since the thallus is covered by small isidial lobuli.

Remarks on morphology. *Nephroma microphyllum* corresponds in some characters with *N.kuehnemannii* and in some with *N.chubutense* (Table 1). In habit *N.microphyllum* resembles *N.chubutense* except for the different color of the upper side

Fig. 1. Habit photographs of *Nephroma* species. A-C, *N.microphyllum* (holotype); A, thallus (x 0.7); B, lobes bearing partly reflexed apothecia (x 4.5); C, young reflexed apothecium and two dark pycnidia (see arrows, x 7.5); D, *N.microphyllum* (paratype), two pedicellate branched pycnidia sitting on the margin of a lobe (x 31). E, *N.microphyllum* (holotype), part of the thallus covered by flat isidial lobes (x 6). F, *N.chubutense* (isotype: UPS), part of the thallus covered by ± brown isidial squamules(x7.5).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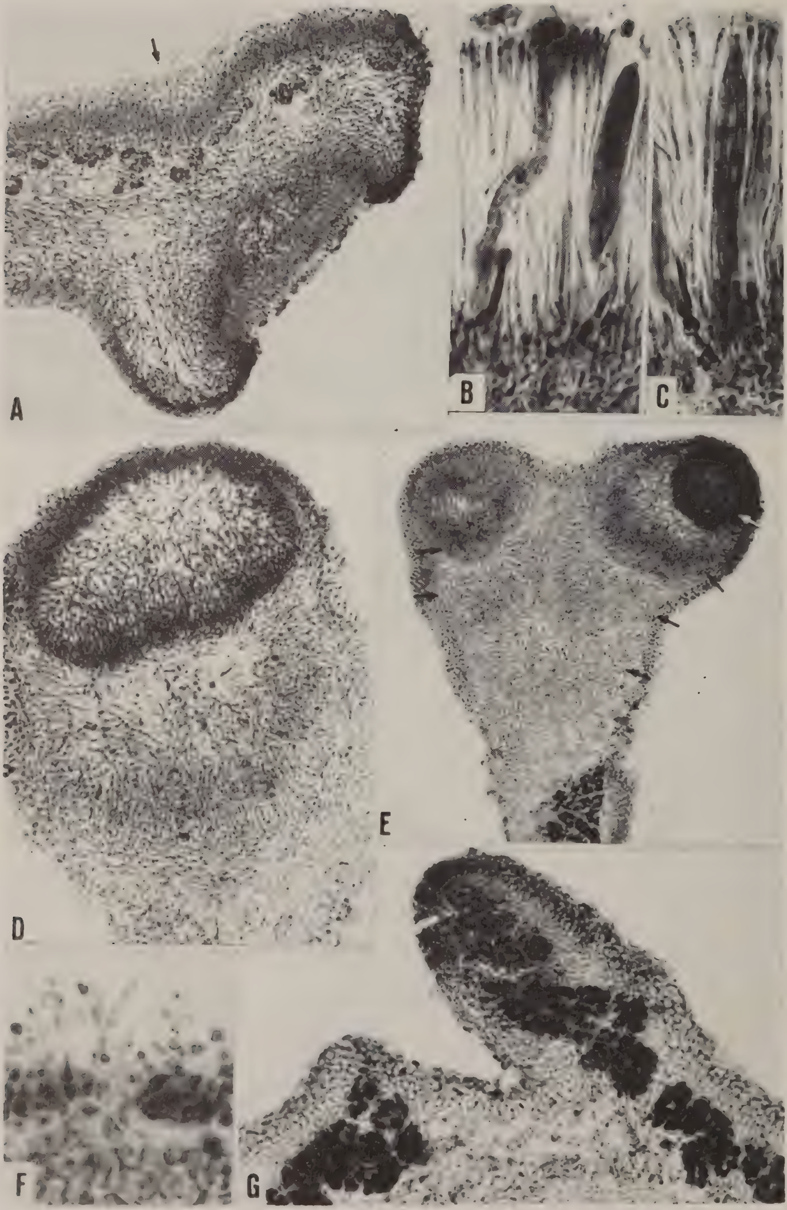
being grey-to blue-olive in *N.microphyllum* and straw-yellow in *N.chubutense*. In both species the thallus is covered by flat isidia or isidial lobes. In *N.microphyllum* the isidial lobes have the same color as the thallus; in *N.chubutense* they are more or less brown.

Table 1. Important taxonomic characters of the *Nephroma kuehnemannii*-species-group

| | *N.kuehnemannii* | *N.microphyllum* | *N.chubutense* |
|---|---|---|---|
| phenarctin | + | + | – |
| spores multicellular-acicular | + | + | ? |
| pycnidia composed and pedicellate | + | + | ? |
| rhizines present | + | + | – |
| squamulose isidial lobes present | – | + | + |
| thallus upperside straw-yellow | + | – | + |
| thallus lower side pale | + | + | – |
| phycobiont *Nostoc* | | | |

In *N.chubutense* the isidia originate as outgrowths of the medullary hyphae as in *Peltigera praetextata* (Somm.) Vain. (Henssen & Jahns 1973), while in *N.microphyllum* they arise from a simultaneous outgrowth of cortex cells and the underlying medullary hyphae (Fig 3 G). The globular

Fig. 2. Anatomy of *Nephroma species* (microtome sections). A, *N.microphyllum* (holotype), upper part of thallus (x 400). B, *N.kuehnemannii* (Henssen 24590c), upper part of thallus (x 400). C-D, *N.microphyllum* (holotype); C, l.s. of rhizine developed from cortical cells (x 100); D, thallus upper cortex bearing a globular structure and moniliform hairs (x630). E, *N.microphyllum* (paratype), thallus lower cortex with tomentum hairs (x 630). F, *N.kuehnemannii* (Henssen 24590c), thallus lower cortex bearing some moniliform hairs (x 630).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cortical structures of *N.microphyllum* resemble stages of isidial development in *Peltigera lepidophyllum* (Nyl.)Vain. in which *Nostoc* cells lying on the thallus surface have been captured and surrounded by hyphae developing from the cortical cells (Henssen & Jahns 1973). In the globular structures of *Nephroma microphyllum,* however, no algal cells were seen.

In *N.chubutense* isidial lobes are developed abundantly laminally and marginally while in *N.microphyllum* they are formed predominately along the margin of the lobes. The lower surface is pale in *N.kuehnemannii* and *N.microphyllum* although very old thalli of the latter species become darkened, a condition which is normal in *N.chubutense*. Both, *N.kuehnemannii* and *N.microphyllum* produce abundant rhizines which arise mainly from the outer cells of the lower cortex (Fig. 2 C), a pattern similar to *N.resupinatum* (L.) Ach. (Hannemann 1973). Moniliform hairs occur in all three species. In *N.microphyllum* the tomentum is well developed on the lower side and along the rhizines (Fig. 2 C, E) and is recognized easily with a hand-lens. Some patches of hairs occur on the upper surface (Figs. 2 D, 3 F). In *N.kuehnemannii* tomentum hairs are rather rare and mainly restricted to the margin of the rhizines. The lower surface of *N.chubutense* is covered in part by a very dense tomentum of moniliform hairs up to 10 cells high.

The structures of the thallus cortices are similar in the three species. The upper cortices are pseudoparenchymatous, composed of anticlinal thin-walled hyphae with isodiametric cells overlied by some rows of cells with strongly gelatinized walls arising from periclinal hyphae. The

Fig. 3. Anatomy of *Nephroma species* (microtom sections). A-B, *N.microphyllum* (holotype); A, young apothecium (x 100); B, part of hymenium (x470). C, *N.kuehnemannii* (Henssen 24590c), part of hymenium (x470). D-G, *N.microphyllum* (Holotype); D, composed pycnidium (x 200); E, branched pycnidium with several levels of superimposed pycnidial cavities (x 100). F, upper cortex bearing moniliform hairs (x 700); G, developing isidial lobes (x 200).

lower cortex is formed by periclinal hyphae and strengthened by cells added by adjacent medullary hyphae. The cells of the lower cortex are relatively roundish and thick-walled in comparison to some other species-groups within the genus *Nephroma*. Crystals of lichen substances may be deposited in the gelatinous walls of the upper cortex and along the medullary hyphae, thus causing a brownish coloration of the medulla and outer layer of the upper cortex in older parts of the thallus.

Apothecia and pycnidia are unknown in *Nephroma chubutense*. In *N.microphyllum* and *N.kuehnemannii* the shape, structure and development of the apothecia and pycnidia correspond closely. The apothecia are ultimately more or less reflexed and surrounded by an incised thalline margine (Fig. 1 B,C). A thick uneven supporting tissue is formed below the hymenium like in other *Nephroma* species (Keuck 1977). The long multiseptate colorless spores are a characteristic feature.

The development of the pycnidia is of special interest. In later stages they are pedicellate and may be branched. The stalk is formed by a successive vertical growth in which a new pycnidium is formed in the upper part of the preceding older cavity; up to four superimposed levels have been observed in *N.microphyllum* (Fig. 3 D,E) and two in a sectioned pycnidium of *N.kuehnemannii*. A branch arises when two young pycnidia are formed simultaneously in the upper part of the old one (Fig. 3 E).The pycnidia in *N.kuehnemannii* are ca. 270 µm long and 150 µm thick, the conidia measure 3.5-4.5 x 1 µm.

Acicular spores and pedicellate pycnidia with superimposed cavities are not known from other groups of *Nephroma* species. Tomentum hairs occur more or less abundantly in a number of species (cf. Wetmore 1960) and similar isidial lobes are present in the *N.helveticum* -, *N.cellulosum* - and the *N.arcticum*-group.

Remarks on chemistry. The major constituent of *N.microphyllum* is a fully substituted depside. The u.v./v.i.s. spectrum (in methanol) shows maxima at 255 nm, 284 nm, 314 nm, minima at 234 nm, 272 nm, 299 nm and an inflextion at 368 nm. The mass spectrum (at 70eV, 230°C) yields fragments at m/e150, m/e178, m/e207 and m/e210. These physical data agree with those given by Bruun (1971) for phenarctin. Thinlayer chromatography of phenarctin in solvent system C exhibits a strongly fluorescence spot of $R_f$ 0.6. The presence of usnic acid was detected by the use of two-directional TLC. Three further diphenyl-carboxylacidesters could be found in the $R_f$-classes 6 and 7. Due to their low concentration structural elucidation has not yet been possible. The chromatographic separation of the crude lichen extract (in acetone) suggests the presence of four triterpinoids in the $R_f$-classes 5 and 7. Two of them possess hopane-character as is concluded from their mass-spectroscopical fragmentation-pattern.

A similar spectrum of triterpenoids has been found by us in *N.kuehnemannii* and *N.chubutense*. *Nephroma microphyllum* contains one more triterpenoid than *N.kuehnemannii*, and *N.chubutense* differs from the other species by the presence of at least one additional triterpenoid, which most likely is identical with the hopane-triol in *Pseudocyphellaria mougeotiana* (Vain.) Del.var. *dissecta* (Müll.Arg.) H.Magn. (Corbett & Cumming 1971). *Nephroma kuehnemannii* also contains phenarctin, usnic acid and the minor constituents mentioned above for *N.microphyllum*.The secondary metabolites thus far characterized are nearly identical in the two species.

A similarity exists between the secondary metabolites of *N.microphyllum* and *N.kuehnemannii* and that of *N.arcticum*, in which Bruun (1971) demonstrated the existence of phenarctin (and nephroarctin). However *N.arcticum* only contains zeorin as a neutral substance and differs moreover by the absence of usnic acid. Further chemical similarities between *N.microphyllum/N.kuehnemannii* and other species-groups of *Nephroma* do not apparently exist.

Taxonomic relationships. The correlation of numerous morphological and chemical characters indicates a close taxonomic relationship between *N.microphyllum* and *N.kuehnemannii* (Table 1).

According to thallus morphology and the similar pattern of triterpenoids, *N.chubutense* is obviously a third species of this clearly difined group within the genus *Nephroma*. Of interest is the correspondance of chemical and morphological features in *N.kuehnemannii* and *N.microphyllum*, species containing different phycobionts. Possibly they represent morphotypes in the sense of James & Henssen (1976) but at present we have no direct evidence. On the other hand, the occurence of a third species *N.chubutense* may indicate a larger group of closely related species having evolved in the Patagonian Andes.

Distribution and ecology. The three species of the *N.kuehnemannii*-group were collected in the evergreen *Fitzroya*-(Alerce-) and/or *Nothofagus dombeyi*-(Coihue-) forests of the Southern Andes (Hueck 1966, Lamb 1955, Redon 1974). They grow on bark of shady trees in the rain forest or in more open areas near streams, and are associated with species of *Pseudocyphellaria*, *Psoroma* and other lichen genera.

## RESUMEN

La nueva especie *Nephroma (Nephromium) microphyllum* Henss. de Argentina se carateriza por tener esporas multiseptadas aciculares, lôbulos isidiales escuamiformes, un tomento de vellos moniliformes a ambos lados del talo y por sus peculiares substancias liquénicas, entre ellas fenarctina, ácido úsnico y ciertos triterpenoides. Se discute el estrecho parentesco con *Nephroma kuehnemannii* M.Lamb y *Nephroma chubutense* M.Lamb. Se indica una nueve localidad para *N.kuehnemannii* y se describen los picnidos de esta especie.

## ACKNOWLEDGEMENTS

We are greatly indebted to professor Redon, Valparaiso and the curators of the herbaria in Uppsala and Buenos Aires to allowing us to study *Nephroma* material, and to the directors of the Parques Nacionales in Argentina for the collecting permit. We also thank Mrs. G. Traute for technical help. The study was supported by a grant of the Deutsche Forschungsgemeinschaft who also provided a grant for field studies in South America.

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# A STUDY OF *AMANITA* TYPES
## II. *A. OCREATA* PECK

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The first publication of this series (Jenkins, 1978) described and/or designated type specimens of names in *Amanita* by C. H. Peck. Since then, the type of *A. ocreata*, not included in the above, was located. Herein, this specimen is described and implicitly designated as the holotype. Colors from the original description are italicized.

*Amanita ocreata* Peck. 1909. Torrey Bot. Club Bull. 36: 330. Holotype (Implicit: *des. mihi*): Claremont, California, i. 1909, C. F. Baker s.n.(NYS).

PILEUS: approximately 6 cm broad, plano-convex, *white*, margin not striate; volva as a very thin, floccose-membranous patch covering most of the pileus surface. LAMELLAE: moderately crowded, broadly sinuate, *white*. STIPE: 8 x 1.2 cm, cylindric, hollow, slightly fibrillose below annulus, becoming glabrous toward base, *white*, base not inflated; annulus superior, thin membranous; volva *white*, 3 cm deep, margin entire and free, membranous, saccate.

PILEIPELLIS: filamentous hyphae densely interwoven to subradial, slightly gelatinized. PILEUS TRAMA: undifferentiated filamentous hyphae up to 8 μm diam; inflated cells oblong elliptic, clavate, to fusiform, up to 95 x 15 μm. LAMELLA TRAMA: bilateral; filamentous hyphae up to 9 μm diam, moderately branched, no clamps; inflated cells oblong elliptic to clavate, terminal or short, terminal chains. SUBHYMENIUM: hyphae inflated ramose to subcellular, no clamps. BASIDIA: up to 55 x 6-14 μm, 4-sterigmate, thin-walled, no clamps. VOLVA: remnants at base of stipe almost exclusively filamentous hyphae, moderately branched, up to 11 μm diam, no clamps, randomly oriented; inflated cells rare, clavate, terminal, up to 140 x 15 μm: volva on pileus same as that at base of stipe. STIPE: filamentous hyphae undifferentiated, moderately abundant, sparsely branched, up to 10 μm diam, no clamps; inflated cells narrowly clavate, terminal, longitudinally oriented, up to 374 x 37.6 μm. PARTIAL VEIL: composed primarily of filamentous hyphae, moderately branched, up to 7 μm diam, randomly interwoven, no clamps; inflated cells numerous, terminal, clavate, up to 30 x 10 μm, occasionally with refractile contents.

SPORES: 9.4-10.9(11.7) x 7.0-8.6 μm ($\underline{E}$ = 1.21-1.46; $\underline{E}^m$ = 1.28), broadly elliptic to elliptic, often adaxially flattened, hyaline, amyloid, thin-walled; contents guttulate; apiculus sublateral, cylindric.

## ACKNOWLEDGEMENTS

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# A NEW BLUING SPECIES OF PSILOCYBE FROM FLORIDA, U.S.A.

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During the II International Mycological Congress at Tampa, Florida, U.S.A., in September 1977, one of the authors (Pollock) collected near Tampa an undescribed bluing species of *Psilocybe*. This interesting novelty is described below. This is the third record of bluing species of *Psilocybe* in Florida. The first was made by Murrill (1941) who described *Stropharia cyanescens* Murr., a synonym of *Psilocybe cubensis* (Earle) Sing. (Singer, 1948) and a very common hallucinogenic fungus throughout Florida. The second record of a bluing species of *Psilocybe* from Florida was made by Guzmán and Thiers (1977) who reported *P. mammillata* (Murr.) Smith, previously known only from Jamaica.

This paper precedes a monograph on the genus *Psilocybe* in preparation by the senior author. He expresses his thanks to the Guggenheim Memorial Foundation at New York for supporting his research. He also expresses his thanks to the directors of the herbaria NY and PC for loan of types. Pollock gratefully acknowledges Dr. R.L. Taylor at the University of Texas Health Science Center at San Antonio for providing laboratory facilities to conduct part of his research. The authors further thank Dr. D.E. Stuntz and Dr. G.A. Escobar, both at the University of Washington in Seattle, for critical review of this paper.

*Psilocybe tampanensis* Guzmán & Pollock, sp. nov. Fig. 1

*Pileo circa 24 mm lato, convexo vel subumbilicato, leve, hygrophano, subviscido, ochraceo-brunneo. Lamellis subadnatis, brunneo-violaceis, marginibus albidis. Stipite circa 50 x 2 mm, rufobrunneo, leve, basi caerulescente;*

*sine annulo. Carne caerulescente, odore et sapore farinaceis. Sporis (7.7-) 8.8-9.9 (-12) x (6-) 7-8.8 (-9.9) x 5.5-6.6 µm, frontaliter subrhomboideis, lateraliter subellipsoideis. Pleurocystidiis nullis. Cheilocystidiis 16-22 x 4-9 µm, copiosis, lageniformibus, hyalinis, collo longis et flexuosis, 2.2-3 µm latis. Subhymenio hyalino, pigmento flavo-brunneo intercelluloso irregulariter deposito. Epicute subgelatinosa. Terricola. Typus: Pollock, Sept. 3, 1977, prope Brandon, Tampa, Florida, U.S.A.* (ENCB).

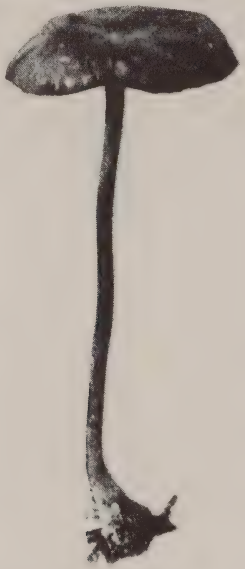

Fig. 1. *Psilocybe tampanensis* Guzmán & Pollock (type), wild carpophore (photo by Pollock).

Pileus about 24 mm broad, convex to slightly umbilicate, smooth, subviscid, hygrophanous, ochraceous brown to straw brown, slightly bluish at the margin. Lamellae subadnate, dark violet brown with whitish edges. Stipe about 50 x 2 mm, fibrous, slightly thickened at the base, smooth but subflocculose at the apex, yellowish brown to reddish brown, with whitish to cesious base. Flesh whitish to yellowish, thin, staining blue when cut. Odor and taste slightly farinaceous. Spore print violaceous purpuraceous brown.

Spores (7.7-) 8.8-9.9 (-12) x (6-) 7-8.8 (-9.9) x 5.5-6.6 µm, subrhombic in face view, subelliptic in side view, brownish yellow (in KOH), with thick smooth wall,a distinct germ pore, and a short appendage. Basidia 14-22 x 8-10 µm, tetrasporic, hyaline, vesiculose or subclaviform. Pleurocystidia absent. Cheilocystidia 16-22 x 4-9 µm, lageniform, with a more or less flexuous long neck 2.2-3 µm in diameter, sometimes irregularly branched, hyaline, abundant, forming a sterile band at the edge of the gill. Subhymenium hyaline, but with yellow brown (in KOH) pigment irregularly incrusted on the walls. Trama regular, light brown to dark yellowish brown, with diffuse pigment; hyphae 10 µm in diameter. Epicutis subgelatinized, consisting of parallel, thin (about 2 µm wide), hyaline hyphae. Hypodermium formed by pigmented to hyaline, elongated to subglobose hyphae. Clamp connections present.

Habitat and distribution. Solitary on sandy soil in a meadow. Known only from the type locality.

Material examined. U.S.A., Florida, near Tampa, SE of Brandon, Sept. 3, 1977, Pollock (Type, ENCB).

Cultural observations. Mycelia were obtained from a spore print of the type on 1% malt extract agar and then brought to fruition in San Antonio by casing spawn grown on ryegrass seeds and crimped oats. Procedures for spawn production on these seed media and subsequent methodology leading to fructification were essentially identical to those employed by Pollock (1977). Casing mycelia grown on composted cattle manure also resulted in formation of fruit bodies. Fruit bodies obtained in culture using a fluorescent light source (Pollock 101 and 102, Dec. 1977, ENCB) did not attain full size during their development and usually failed to sporulate. Pileus small (less than 10 mm in diameter); stipe thin (1-2 mm in width), usually very short (less than 35 mm in length) or sometimes elongated (up to 113 mm in length). P. tampanensis is strongly heliotropic. Fruit bodies obtained in a fiberglass greenhouse (Pollock 110, March 1977, ENCB) were robust and sporulated copiously. Pileus sometimes reached 38 mm in diameter; stipe thick (often 4-5 mm wide) and reached up to 60 mm in length. Carpophores tend to grow in large clusters on the casing soil. Both browing and bluing are observed. The former tends to predominate unless the latter is accelerated by handling or tissue damage. These same oxidative phenomena occur in sclerotia produced by mycelia in cultivation.

Production of sclerotia in cultivation was observed for P. mexicana (Heim & Cailleux, 1957, and Heim et al., 1958). Guzmán (1978) reported sclerotia in wild conditions in P. caerulescens and Pollock (1978) has observed their socio-economic importance to the Mazatecs of Oaxaca. It is interesting to note that for Psilocybe sclerotia have been reported in P. mexicana, P. caerulescens, and P. tampanensis.

Discussion. P. tampanensis is close to P. mexicana Heim and P. caerulescens Murr. but differs from the former in the shape of the fruiting body and size of the basidia and from the latter in the size of spores and cheilocystidia. In fact, P. mexicana has a mycenoid habit and basidia 22-24 (-32) x 7.7-11 µm; where as P. caerulescens has a collybioid habit, spores (6-) 6.7-8 (-8.5) x 5.2-6.5 x 3.3-5.2 µm, and cheilocystidia 15-22 x (3-) 4.4-5.5 µm, according to examination made by the senior author of both types (PC and NY respectively). P. tampanensis seems to be a subtropical species intermediate between P. caerulescens and P. mexicana. P. caerulescens occurs from Alabama (U.S.A.) to Venezuela (a new rocord recently made by the senior author), and P. mexicana has a distribution from Mexico to Guatemala (recently reported from the latter country by Lowy, 1977). Both fungi are hallucinogenic and are found in meadows or open places of the subtropical forests. Because of its close relationships with the previously mentioned hallucinogenic species, P. tampanensis is very probably to contains psilocin and psilocybin. A bioassay by Pollock has established that this fungus is psychoactive in man.

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# STUDIES ON THE LICHEN FAMILY THELOTREMATACEAE. 4*

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## Abstract

Ten new species in the lichen family Thelotremataceae are described: *Ocellularia diacida* Hale, *O. karnatakensis* Hale, *O. minuta* Hale, *O. patwardhanii* Hale, *Phaeotrema psoromicum* Hale, *P. scabridum* Hale, *Thelotrema exile* Hale, *T. planarium* Hale, *Leptotrema africanum* Hale, and *L. mammiculum* Hale. The new combination *Ocellularia astroidea* (Berk. & Broome) Hale is proposed, and *Phaeotrema aggregatum* Hale, *Thelotrema dislaceratum* Kremph., and *T. papillosum* Hale are discussed.

### 1. OCELLULARIA ASTROIDEA (Berk. & Broome) Hale, comb. nov. Fig. 1

*Platygrapha astroidea* Berk. & Broome, Journ. Linn. Soc. 14:109. 1875. Type collection: Ceylon. *Thwaites* 629 (K).

Specimens examined. Sri Lanka. Sabaragamuwa Prov.: Sinharaja Forest Reserve near Weddagala, *Hale* 47127 (US); Gilimale Forest Reserve, *Hale* 46297, 46365 (US). Southern Prov.: Moravaka Hill near Deniyaya, *Hale* 47037 (US).

This species was originally described as a fungus and even transferred to the genus *Cryptodiscus*. It is, however, lichenized, a member of the *Ocellularia alborosella* complex, and characterized by a broad, thin, lightly pruinose disk (0.7-1.5 mm wide), a delicate, recurved thalline margin with or without a persistent inner exciple, and the dark hypophloeodal thallus. The spores are small (3-4 X 10-15 µm) and I negative. There are no chemical substances present. The species is known only from lowland rainforest in Sri Lanka where it typically occurs on the lower trunk.

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*All chemical tests were done with thin-layer chromatography in two solvent systems. I would like to acknowledge the logistical support of the Maharashtra Association for the Cultivation of Science, Poona, in India and the Flora of Ceylon Project in Sri Lanka. Contribution No. 3 in this series was published in *Mycotaxon* 3: 173-181. 1975.

### 2. OCELLULARIA DIACIDA Hale, sp. nov. Fig. 2

Thallus corticola, epiphloeodes, planus vel verruculosus, aetate rimosus, pallide castaneus, 6-10 cm latus; apothecia numerosa, semiemergentia vel vix emergentia, 0.4-0.6 mm diametro, apice fuliginea, columellata, columella 50-75 µm diametro, excipulo proprio connato; hymenium 90-100 µm altum; sporae 8:nae, incolores, transversim 6-8 loculatae, 4-8 X 16-25 µm, I+ caerulescentes.

Chemistry: Two unknown substances ($H_2SO_4$ + brown) forming a double spot above norstictic acid in Culberson's solvents A and B along with possible traces of norstictic acid.

Holotype: Evergreen forest, Devimane Ghat on Kumtha-Sirsi road, Karnataka, India, elev. about 100 m, M. E. Hale 47933 (US; isotype in AMH).

Additional specimens examined. India. Karnataka: Hebri-Udipi road, *Hale* 47893 (US); Ballur, Sagar-Anandpur road, *Hale* 47872, 48085 (US); Kumtha, *Patwardhan & Kulkarni* 77.132 (AMH, US).

This species externally resembles *O. perforata* (Lgt.) Müll. Arg. but can be distinguished by the more emergent, verruculose apothecia and unique chemistry. It is apparently endemic to the evergreen monsoon forests in the Western Ghats region at lower elevations.

### 3. OCELLULARIA KARNATAKENSIS Hale, sp. nov. Fig. 3

Thallus corticola, epiphloeodes, crassus, opacus, bullatus vel crasse isidiatus, isidiis solidis, usque ad 0.5 mm diametro, apice nitidis, albidis, pallide castaneus, ad 12 cm latus. Apothecia immersa, 0.4-0.7 mm diametro, columellata, columella ca. 150 µm diametro; ostiolum parvum, rotundatum, 0.1 mm latum, albo-pruinoso-annulatum; hymenium ca. 280 µm altum; sporae 2-4:nae, incolores, transversim 12-16 loculatae, 10-12 X 90-150 µm, I+ caerulescentes.

Chemistry: "Chonestoma" series (K-, P-).

Holotype: Liana in evergreen forest, 5 km SE of Yellapur, Karnataka, India, elev. about 600 m, M. E. Hale 46205, 25 Feb. 1977 (US; isotype in AMH).

Additional specimens examined. India. Karnataka: Devimane Ghat, *Hale* 47860 (US); Agumbe-Koppa road, *Hale* 47870 (US); Yellapur to Karwar, 2-10 km east of Yellapur, *Hale* 48020 (US).

The "chonestoma" series includes a spot from the *Ocellularia olivacea* series (see Hale, 1974:24) and a higher one, reacting yellowish rather than gray with $H_2SO_4$, which is absent in *O. olivacea*. It is found in *O. groenhartii* Hale, also known from India, another large-spored species with semi-emergent apothecia. *Ocellularia karnatakensis* is distinguished morphologically by the flush or immersed apothecia and the often conspicuously developed "isidia," which are exceptionally coarse and perhaps better defined as cylindrical verrucae. The species is typical of the evergreen monsoon forest at the edge of the Western Ghats at 600-800 m elevation, occurring on lower trunks and lianas.

### 4. OCELLULARIA MINUTA Hale, sp. nov. Fig. 4

Thallus corticola, epiphloeodes, crassus, nitidus, planus, aetate rimosus, pallide viridi-albus, usque ad 10 cm latus; apothecia numerosa, dispersa, immersa, ca. 0.2 mm diametro, intus pallida, columella nulla atque excipulo proprio evanescenti; hymenium ca. 90 µm altum; sporae 8:nae, male evolutae, incolores, 4 X 15 µm, transversim 5-6 loculatae, I+ caeruleae.

Chemistry: Fumarprotocetraric acid.

Holotype: Virgin rain forest along trail over Moravaka Hill southwest of Deniyaya, Matara District, Southern Province, Sri Lanka, elevation about 200 m, M. E. Hale 47033 (US; isotypes in BM, PDA).

Additional specimen examined. Sarawak: Mt. Matang, *Hale* 30768 (US).

This species differs from others with flush, immersed apothecia (e.g. *O. alba* (Fée) Müll. Arg.) in having very small pores. The chemistry is unique, no other species in the genus being known with fumarprotocetraric acid. It is a canopy species in lowland dipterocarp forests.

### 5. OCELLULARIA PATWARDHANII Hale, sp. nov. Fig. 5

Thallus corticola, epiphloeodes, nitidus, continuus sed valde verruculosus, pallide castaneo-albidus, 5-7 cm latus. Apothecia numerosa, emergentia, 0.8-1.2 mm diametro, amphithecio verrucoso, columella nulla, excipulo proprio non persistenti; ostiolum rotundatum minutumque, plus minusve depressum, 0.05-0.1 mm diametro; hymenium ca. 250 µm altum; sporae 1-2:nae, incolores (vel aetate fuscescentes), transversim 20-30 loculatae, 21-25 X 150-210 µm, I+ caerulescentes.

Chemistry: Norstictic acid.

Holotype: Near Agumbe, Karnataka, India, elev. about 600 m, P. G. Patwardhan 77.426, 28 Feb. 1977 (AMH; isotype in US).

Additional specimen examined. India. Karanataka: Evergreen forest, Agumbe-Koppa road, *Hale* 47961 (US).

The diagnostic feature of this Indian endemic is the presence of norstictic acid, a very rare acid in the genus (known so far only in an undescribed species from New Zealand). The apothecia are semiemergent but barely distinguishable from the thalloid verrucae except for the small pore. The *Hale* 47961 collection, which has brownish spores, is senile and covered with epiphytic algae. Darkening of similarly large spores is also known in *O. fecunda* (Vainio) Hale (see Hale, 1974:20). This is another species peculiar to the evergreen monsoon forest of the Western Ghats. It is named in honor of Dr. P. G. Patwardhan, lichenologist at the Maharashtra Association for the Cultivation of Science.

### 6. PHAEOTREMA AGGREGATUM Hale

Smithsonian Contr. Bot. 16:29. 1974. Type collection: Dominica, *Hale* 35229 (US, holotype).

Additional specimens examined. Sri Lanka. Western Province: Morapitiya logging area, *Hale* 51021 (US); South of island: *Thwaites* C.L. 167 (BM, S, UPS). Dominica: Dom-Can logging area at Dleau Gommier, elev. 1600-1700 ft., *Hale* 35177 (US).

This species is now represented by a second collection from Dominica, which had previously been misidentified as a *Phaeographis*. It is also known, rather unexpectedly, from Sri Lanka from a Thwaites collection made in the 1860's and identified by Leighton (1869) as *Thelotrema auberianum*. I recollected it on tree tops in dipterocarp forest. It has clustered chroodiscoid apothecia and a thin, waxy, often olivaceous thallus.

### 7. PHAEOTREMA PSOROMICUM Hale, sp. nov. Fig. 6

Thallus corticola, epiphloeodes, nitidus, minute verrucosus, sparsissime isidiato-bullatus, pallide brunneo-albus (in herbario), 5-8 cm latus; apothecia numerosa, immersa vel semi-emergentia, 0.3-0.6 mm diametro, apice fuliginea, columella nulla, excipulo proprio non distincto; ostiolum rotundatum, ca. 0.1 mm diametro; hymenium ca. 120 µm altum; sporae 8:nae, fuscae, 8-10 X 20-24 µm, transversim 5-6 loculatae.

Chemistry: Psoromic acid.

Holotype: On tree, Mt. Gegerbentang, West Java, elev. 1800 m, P. Groenhart 2200 (L; isotype in US).

This ecolumellate species has apothecial structure similar to the ecolumellate populations of *Ocellularia papillata* (Lgt.) Zahlbr. (see Hale, 1974:24). Other psoromic acid-containing species of *Phaeotrema* have either much larger emergent apothecia or a columella.

### 8. PHAEOTREMA SCABRIDUM Hale, sp. nov. Fig. 7

Thallus humicola vel muscicola, fragilis, opacus, minute scabridus, albus, 8-12 cm latus; apothecia semi-emergentia vel fere erecta, aggregata, cum thallo concolora, 0.3-0.5 mm diametro, intus pallida, columella nulla, excipulo proprio non distincto; ostiolum nigrum, rotundatum, 0.05-0.1 mm diametro; hymenium 65-75 µm altum; sporae 8:nae, fuscae, 6 X 12-14 µm, transversim 3-4 loculatae.

Chemistry: Psoromic and norpsoromic acids.

Holotype: On humus in open forest on Tourist Trail between Layang Layang and Paka Cave, Kinabalu National Park, Sabah, elev. 2700-2900 m, M. E. Hale 28055, August 1964 (US).

Additional specimen examined. Sabah: Layang Layang, Kinabalu National Park, *Hale* 28346 (US).

This species is distinguished by the white, scabrid thallus and the unusual habitat, exposed detritus and humus or tree bases. It has no close relatives in the genus.

9. THELOTREMA DISLACERATUM Kremph. Fig. 8

Giorn. Bot. Ital. 7:17. 1875. Type collection: Sarawak, *Beccari* 208 (M, lectotype).

This species was first published without spore information as *Thelotrema* (?) *dislaceratum*. I re-examined the type and was able to find colorless, muriform spores about 10 X 20 µm in size. It is, therefore, correctly placed in *Thelotrema*. The disc is open, 0.5-0.8 mm wide, irregular in outline, and slightly pruinose. The coarse thalline margin is carbonized and erect, almost chroodiscoid but lacking any trace of a proper exciple. Psoromic and norpsoromic acid are present. The only other psoromic acid-containing species in *Thelotrema* with an open disc is *T. wrightii* Tuck., which has a coarse noncarbonized rim and spores about 6 X 12 µm (see Hale, 1978:48).

10. THELOTREMA EXILE Hale, sp. nov. Fig. 9

Thallus corticola et muscicola, epiphloeodes, fragilis, nitidus, crasse verruculosus, cremeo-albidus, 10 cm latus; apothecia emergentia, amphithecio verruculoso, 0.7-1.0 mm diametro, intus pallida, excipulo proprio connato; ostiolum rotundatum, depressum, 0.1 mm diametro; hymenium pallidum, ca. 300 µm altum; sporae 1:nae, 40-50 X 200-225 µm, dense murales, I+ caeruleae.

Chemistry: Psoromic acid.

Holotype: Small ridge just above E. Mesilau River, Kinabalu National Park, Sabah, elev. 1900 m, M. E. Hale 28249, Aug. 1964 (US).

The closest relative is *T. endoxanthum* Müll. Arg. from Australia, which also has psoromic acid and large spores but differs in having a nonbullate, thicker thallus. The thallus of *T. exile* is thin and fragile. Apothecia are barely distinguishable from the coarsely verrucose thallus.

11. THELOTREMA PAPILLOSUM Hale

Smithsonian Contr. Bot. 16:36. 1974. Type collection: Dominica, *Hale* 38124 (US).

This species, previously known only from Dominica, has been collected a second time by Oberwinkler and Poelt on the mountain El Avila north of Caracas. It is an inconspicuous species with the apothecia nearly lost among the irregular, erupting masses.

Specimen examined. Venezuela. Distrito Federal: El Avila, elev. 2000-2200 m, *Oberwinkler and Poelt* s.n. (M, US).

### 12. THELOTREMA PLANARIUM Hale, sp. nov. Fig. 10

Thallus corticola, epiphloeodes, nitidus, laevis, aetate fissus, cinereo-albus, 5-7 cm latus. Apothecia numerosa, immersa vel vix emergentia, 0.4-0.8 mm diametro, columellata, columella ca. 90 µm diametro, raro deficienti; ostiolum rotundatum, albo-annulatum, 0.1-0.18 mm diametro; hymenium 100-120 µm altum; sporae 8:nae, incolores, 0-1 X 5-6 loculatae, 9-10 X 15-20 µm, I+ caerulescentes.

Chemistry: Psoromic and norpsoromic acids.

Holotype: Gudampara, Cardamom Hills, Kerala, India, elev. 1100 m M. E. Hale 46427, 25 Jan. 1976 (US; isotype in AMH).

Additional specimen examined. India. Kerala: Kumili-Devicolam road, *Hale* 46548 (US).

The psoromic acid-containing species of *Thelotrema* form a difficult, intergrading series. *Thelotrema planarium* stands alone in having nearly flush apothecia, a thick thallus, and a central columella. In India it is closest to *T. masonhalei* Patw. & Kulk., which has a small, white-rimmed pore and large spores.

### 13. LEPTOTREMA AFRICANUM Hale, sp. nov. Fig. 11

Thallus corticola, epiphloeodes, verruculosus, opacus scabridusque, pallide viridi-cinereus, 2-4 cm latus; apothecia numerosa, separata, emergentia, aetate basin constricta, urceolata, amphithecio cum thallo concoloro, scabrido, 0.8-1.0 mm diametro, intus pallida, columella nulla, excipulo proprio persistenti, crasso; ostiolum rotundatum, vix annulatum vel albo-cinctum, ca. 0.15 mm diametro, excipulo interiori prominenti; hymenium ca. 300 µm altum; sporae 1:nae, fuscae, 45-60 X 150-170 µm, dense murales, I-.

Chemistry: No substances present.

Holotype: On tree in rain forest, near Forestry House, Amani, Usambara Mtns., Tanga Prov., Tanzania, elev. ca. 900 m, R. Moberg 1464b (UPS; isotype in US).

Additional specimen examined. Same locality as holotype, *Santesson* 23134 (Santesson herbarium, US).

The large, noncarbonized apothecia, annulate pore with the inner free exciple appearing as in inner pore, and the dull scabrid thallus are distinctive features of this *Leptotrema*. It is known only from the type locality.

### 14. LEPTOTREMA MAMMICULUM Hale, sp. nov. Fig. 12

Thallus corticola, epiphloeodes, nitidus, minute verrucosus, pallide castaneus, ca. 5 cm latus; apothecia numerosa, congesta, valde emergentia, aetate basin constricta, urceolata, 0.6-0.8 mm diametro, intus pallida, columella nulla, excipulo proprio connato; ostiolum conspicue annulatum, albo-cinctum, 0.15-0.2 mm diametro; hymenium ca. 150 µm altum; sporae 8:nae, fuscae, 10-12 X 20-24 µm, transversim 3-5 loculatae, longitudinaliter 1-2 loculatae.

Chemistry: Protocetraric acid.

Holotype: Canopy in virgin dipterocarp forest at the TIMEX logging area west of Ipil, base of Mt. Silligain, Zamboanga del Sur Prov., Philippines, elev. about 200 m, M. E. Hale 24797, June 1964 (US).

The crowded urceolate apothecia and conspicuously annulate pore set this species apart from all others in the genus.

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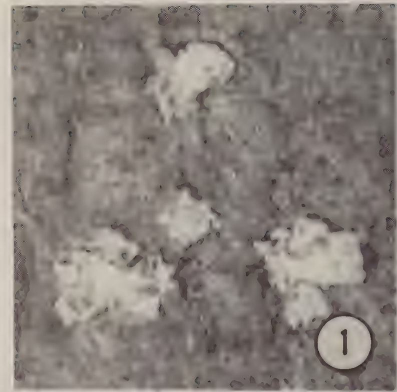
Explanation of figures 1-12:1, *Ocellularia astroidea* (*Hale* 46297); 2, *O. diacida* (*Hale* 47933); 3, *O. karnatakensis* (*Hale* 46205); 4, *O. minuta* (*Hale* 47033); 5, *O. patwardhanii* (*Patwardhan* 77.426); 6, *Phaeotrema psoromicum* (*Groenhart* 2200); 7, *P. scabridum* (*Hale* 28055); 8, *Thelotrema dislaceratum* (*Beccari* 208 in M); 9, *T. exile* (*Hale* 28249); 10, *T. planarium* (*Hale* 46427); 11, *Leptotrema africanum* (*Moberg* 14646); 12, *L. mammiculum* (*Hale* 24797). Scale shown in figs. 6 and 12 is 1 mm.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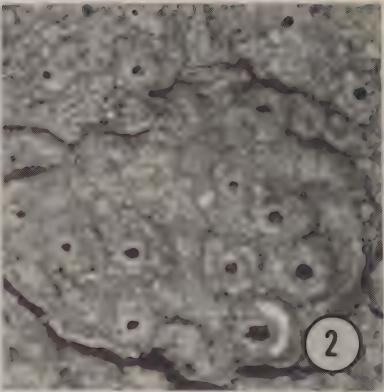
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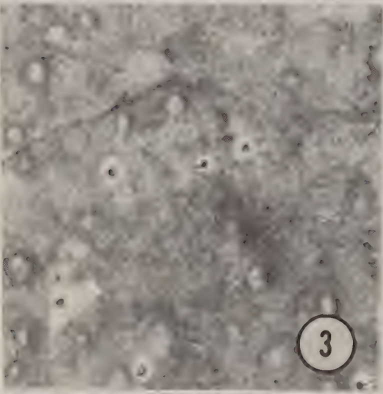
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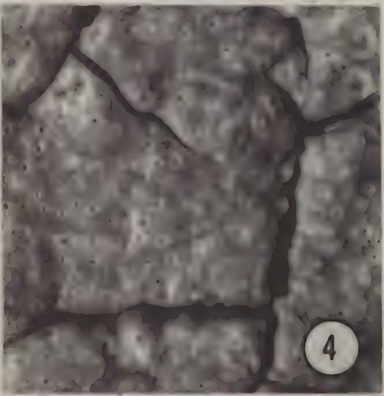
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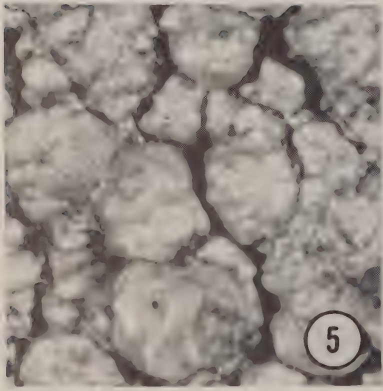
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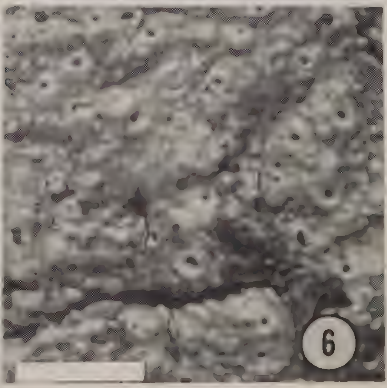
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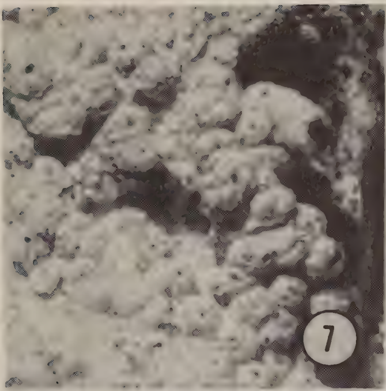
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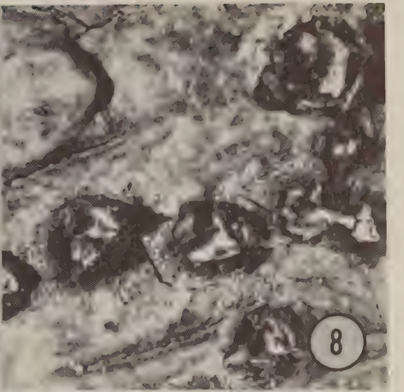
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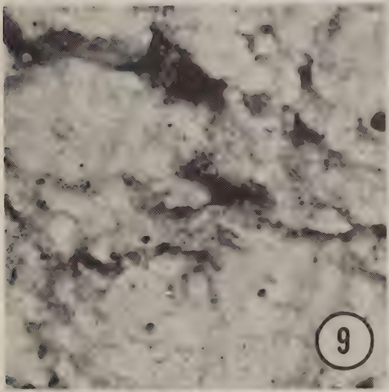
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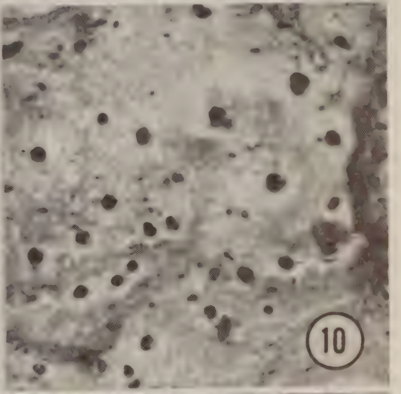
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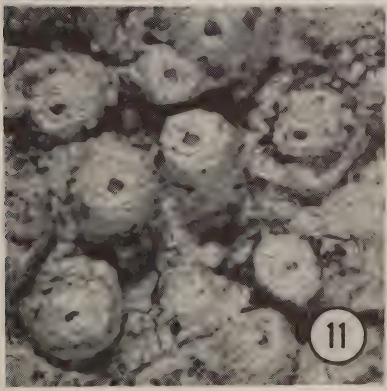
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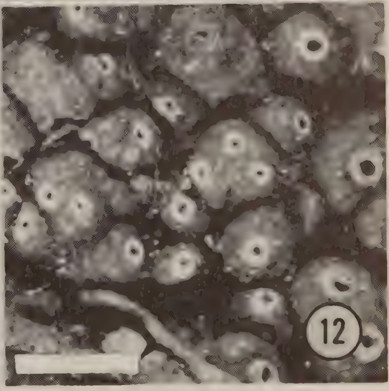
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MYCOTAXON

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# TYPE STUDIES ON CLAVARIOID FUNGI. V. A FEW AUSTRALASIAN TAXA.

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As cited in other papers (Petersen, 1978a, b), I had the privilege of collecting clavarioid fungi in Australia in 1977. As valuable as field experience may be, however, the foundation of taxonomy remains the type method, and an incorrect interpretation of names only adds confusion to the literature instead of order.

All of the taxa reported herein either were described from Australian specimens or were suspected of occurring there. Because all were treated in some way by Corner (1950, 1970), the best authority on Pacific clavarioid fungi, no surprises were anticipated in the examination of these types, but surprises were forthcoming nonetheless. These are included in the comments following each taxon.

*Clavaria archeri* Berkeley. 1860 Fl. Tasmanica, t. 188, fig. 3 (teste Corner, 1950).

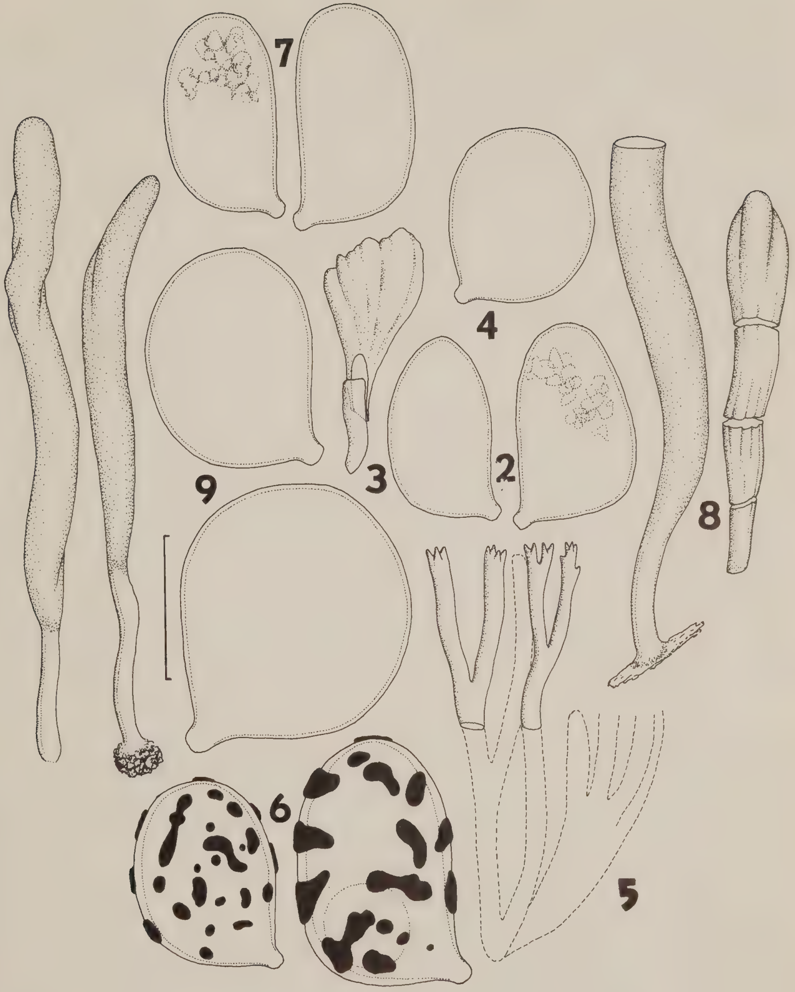
Type: K - Tasmania, no date, s.n.

Fruit body (one) in two fragments (fig. 3), total about 2.5 cm high, about 8 mm broad, simple, laterally flattened (thickness about 1.5 mm), solid; apex shallowly lobed.

Basidia 55-65 X 6.2-6.8 µm, clavate, clamped, somewhat refringent under phase contrast; contents homogeneous (in preservation?) to obscurely heterogeneous but not clearly guttulate; sterigmata 4, stout, conical, divergent, not cornute.

Spores (fig. 4) 5.6-6.7 X 5.2-6.0 µm ($\underline{E}$ = 1.07-1.21; $\underline{E}^m$ = 1.15; $\underline{L}^m$ = 6.32 µm), subglobose to very broadly ellipsoid, usually slightly flattened adaxially; wall thin; contents homogeneous; apiculus papillate, less than 1 µm long.

Although presumably an aberrant fruit body, almost all descriptions of the taxon have faithfully reproduced the idea of the flabellately clavate apex, either because of some reference in the original description (which I have not seen), or examination of the type specimen.



Explanation of figures

Figs. 1, 2. *Clavaria aurantia*. 1. Fruit bodies. 2. Spores. Figs. 3, 4. *Clavaria archeri*. 3. Fruit body. 4. Spore. Figs. 5, 6. *Clavaria lorithamnus*. 5. Fruit body, showing outline of missing portions in dashed lines. 6. Spores. Fig. 7. Spores of *Clavaria muelleri*. Figs. 8, 9. *Clavaria tasmanica*. 8. Fruit bodies. 9. Spores. Standard line = 5 μm for spores, 0.5 cm for fruit bodies.

Microscopically, the taxon is clearly part of the *Clavulinopsis amoena* - *C. miniata* complex, and may well be contaxic with *C. amoena*. It is surely not the elongate-spored taxon envisioned by Corner. Many spores are semi-collapsed, and become pleated, appearing elongate, but when uncollapsed spores are examined, they are always as above.

Corner (1950: 355) synonymized *C. archeri* and *C. aurantia*, reporting that he had examined both types at Kew. Later (Corner, 1970: 72) he opined that *C. archeri* was near *C. pulchra* ( = *C. laeticolor*), also erroneous, for *C. laeticolor* spores exhibit the very long apiculus of a different subgenus.

*Clavaria aurantia* Cooke & Massee in Cooke. 1887. Grevillea 16: 33.

Type: K - Harkaway Range, Victoria, C. French, Sen., vi. 1887, no. 8108.

Fruit bodies (fig. 1) (two) up to 4 cm long, up to 3 mm broad, simple. Stipe up to 1.5 mm thick, up to 10 mm long, clearly differentiated from club, equal, inserted in soil without subiculum, smooth but not glabrous. Club somewhat laterally compressed, smooth; apex tapering to nearly equal, abruptly hemispherical (cf. fig. from type).

Basidia up to 70 X 7.5 µm, elongate-clavate, clamped; contents minutely granular, often with amorphous crystalline material in upper portion; sterigmata (2-3)-4, stout, conical, divergent.

Spores (fig. 2) 6.3-7.0 X 3.7-4.8 µm ($\underline{E}$ = 1.46-1.90; $\underline{E}^m$ = 1.70; $\underline{L}^m$ = 6.74 µm), ellipsoid, usually somewhat flattened adaxially; wall very thin; contents homogeneous (in preservation?) to including amorphous granular material (the remnants of a guttule?); apiculus eccentric, papillate, up to 1 µm long.

Most spores are in some state of collapse, but none were seen with the characteristic amygdaliform profile shown by Corner (1950: 342). Conversely, I have examined many specimens of this taxon, and some seem to produce spores lacking the distal attentuation, while others show this feature clearly, although in various percentages of total spores examined. I consider that the taxon fits well with other elongate-spored members of *Clavulinopsis*, such as *C. gracillima*, *C. maricola*, etc. Most assuredly, however, *C. aurantia* is not synonymous with *C. archeri*, as reported by Corner.

*Clavaria lorithamnus* Berkeley. 1873. J. Linnean Soc. Bot. 13: 169.

Type: K - Dandenong, Australia. Herb. Berkeley, s.n.

Fruit body (fig. 5) (one) in fragments (two), apparently the ultimate 2 cm of two branch systems; about 4 cm high, about 2 cm broad (pressed), branched. Stipe tapering downward, fasciculate (at least two fascicles in original specimen); branches dichotomous, up to 3 mm thick; axils narrowly rounded; apices dentate to minutely digitate.

Tramal hyphae up to 12 μm diam, hyaline, without clamp connections, parallel, thin-walled. Basidia without clamps, collapsed.

Spores (fig. 6) 6.3-8.2 X 4.8-5.6 μm ($\underline{E}$ = 1.29-1.54; $\underline{E}^m$ = 1.44; $\underline{L}^m$ = 7.31 μm), broadly cylindrical to broadly ellipsoid; wall up to 0.3 μm thick; contents homogeneous to minutely granular; ornamentation of scattered low warts which hardly anastomose into ridges; apiculus conical, truncate.

This is surely *Ramaria sinapicolor* (Cleland) Corner. Corner (1950, 1970) persisted in his interpretation of this taxon as a *Ramariopsis*, even after examining the type. Comparision of his illustrations of the spores of *C. lorithamnus* (1950: 644) with *Ramaria* spores (i.e. *R. polypus*, 1950: 617) reveals very little difference, surely not enough on which to separate genera.

*Clavaria kalchbrenneri* Mueller may be synonymous, but I have not seen type material so abstain from conclusions.

*Clavaria miltina* Berkeley. 1852. London Jour. Bot.: 140.

Type: K - Khasia no. 3, K. no. H1232/77, 2.

I reported on this type specimen previously (Petersen, 1967), but because Australia seems inhabited by several deeply pigmented clavarioid fruit bodies, it seemed worthwhile to examine the specimen again, especially after an additional decade of experience with such fungi. Interestingly, the only additional data which now can be supplied are as follows: 1) hyphae of at least the smaller fruit body are clamped, and 2) tramal hyphae of both fruit bodies involve quantities of amorphous crystalline material. On the contrary, I saw no basidia and no spores this time, but there is evidence of a third fruit body from which these reports may have come, but now is all but missing.

Because the data seem so meager and equivocal, I will henceforth treat the name as a *nomen dubium* on the paucity of type material. Berkeley contrasted the taxon to *Calocera*, and the meager evidence of holobasidia supports this.

*Clavaria muelleri* Berkeley in Cooke. 1891. Grevillea 20: 10.

Type (lectotype, des. mihi): K - Queensland, s.n.

Fruit bodies (two) up to 3 cm high, up to 1.2 mm broad, simple. Stipe up to 0.7 mm thick, up to 4 mm long, equal, easily distinguished from club, inserted nakedly in soil, smooth, perhaps glabrous when fresh. Club narrowly fusiform, smooth, narrowly rounded apically.

All microscopic structures agglutinated or coherent through preservation. Basidia apparently very short (less than 30 µm long).

Spores (fig. 7) 6.7-8.2 X 3.7-4.1 µm ($\underline{E}$ = 1.80-2.20; $\underline{E^m}$ = 1.91; $\underline{L^m}$ = 7.33 µm) short cylindrical, thin-walled, mostly collapsed.

The spores are in various stages of collapse, and although I cannot find clamp connections, I have been unable also to clearly see crosswalls, so clamps may have escaped me. Spore shape and white fruit bodies would suggest *Clavaria vermicularis* Fr., as surmised by Corner (1950), but I do not wish to conjecture unduly and will henceforth treat the name as a *nomen dubium* until better material can be unearthed.

Even the meager microscopic observations indicate that the taxon is not a *Clavulinopsis* for nomenclatural reasons. The specimen from Queensland is selected as lectotype, but the description above is taken from both specimens at K. Two locations (Victoria, Queensland) were mentioned in the protologue. The second K specimen bears the following: "no. 79. 1867. April. Neercool Creek." I assume this to be the Victoria material.

*Clavaria portentosa* Berkeley & Broome. 1882. Trans. Linnaean Soc. II 2: 65.

Type: K - Brisbane, no. 426 (in part), F. M. Bailey, pl. xiv, fig. 17, Herb. C. E. Broome.

Fruit body (one) 11.5 X 5 cm, branched up to five ranks, now virtually black and strongly cartilaginous; branching thelephoroid, of many flattened and anastomosing lower portions arising from wood and leaves and surrounding long portions of the monocot leaf and stem fragments; middle branches flattened, rebranched in polychotomous fashion into ultimate branchlets; apices up to 1.5 cm long, less than 1 mm thick, acerose to subulate, terete, prolonged, irregularly dichotomous.

Tramal hyphae 3-12 µm diam, refringent under phase contrast, thin-walled upward, thick-walled (wall up to 2 µm thick) in lower portions, without clamp connections. Basidia not observed.

Spores 5.7-6.4 X 4.5-5.0 µm, ellipsoid, smooth, hyaline; contents refringent under phase contrast; wall thin; hilar appendix papillate, small.

On cursory examination, the fruit body appears to have a long, thick stipe, and is reminiscent of *Ramaria zipellii*. Hyphal construction and spore morphology dictate that it is an *Aphelaria* ss. Corner (1950), however, and as such it matches the circumscription of *A. flabellata* (Wakefield) Corner (1950). Petersen (1969) reported on the type specimen of *Clavaria* (*Apheleria*) *complanata* Cleland, which also matches this collection except for fresh color. The two taxa differ so little (except in described colors) that they may simply be stages in a single species, but because the name *C. portentosa* antedates both, a new combination seems required, as follows:

*Aphelaria portentosa* (Berkeley & Broome) Petersen, comb. nov.

Bas: *Clavaria portentosa* Berk. & Broome. 1883. Trans. Linnaean Soc. II 2: 65, pl. 14, fig. 15.

I regard *A. flabellata* as synonymous, and *A. complanata* as probably so.

*Clavaria tasmanica* Berkeley in Cooke. 1891. Grevillea 20: 10.

Type: K - s.n., no data except "Clavaria tasmanica B., five fragments." Within packet is a small packet and a small label: "Tasmanica B. Type" in Corner's hand.

Fruit bodies (fig. 8) (two) in fragments, probably about 2 cm high, about 2 mm thick, simple, deep olive-gray; stipe about 1 mm thick, up to 6 mm long, equal, arising from off-white subiculum which extends up to 2 mm; club smooth, deeply pigmented, elongate-fusiform; apex rounded to irregularly subrugose or lobed, but not branched.

Tramal hyphae up to 20 μm diam, thin-walled, clamped, roughly parallel, not agglutinated, under bright field pale golden (indicating pigmentation). Hymenium greatly thickened, easily separated from trama; basidia up to 80 X 8 μm, subcylindrical; basidial contents golden under bright field; post-partal septation apparently lacking; sterigmata two, cornute. Cystidia none.

Spores (fig. 9) 7.4-8.9 X 6.3-8.1 μm ($\underline{E}$ = 1.00-1.29; $\underline{E}^m$ = 1.12; $\underline{L}^m$ = 8.17 μm), globose to subglobose, smooth, somewhat refringent under phase contrast, very pale golden under bright field (pigmented?); wall thin; contents now homogeneous; hilar appendix papillate.

The specimen represents a simple, dark-colored *Clavulina* with clamps, pigmented hyphae and no cystidia. All these characters, as well as the easily separable hymenium match those of *Clavaria* (*Clavulina*) *geoglossoides* Corner. That species, represented by only the type at MELU, is somewhat dubious, for the type is heavily infected with a dark mycelium which may account for Corner's (1970) report of cystidia. I consider the two names synonymous.

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# ETUDE SUR LES CHAMPIGNONS PARASITES DU SUD-EST ASIATIQUE. 31. LES CERCOSPORA DE FORMOSE. IV.

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ET

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*ABSTRACT*

This report deals with three species of pathogenic fungi which are parasitic in the leaves of sugarcane in Taiwan. Two of them are new: *Cercospora whalianensis* nov. sp. and *Leptosphaeria kuangfuensis* nov. sp.

En étudiant les échantillons récoltés à Formose par M. Shou-kung SUN, Professeur de Phytopathologie à l'Université National de Chung Hsing, nous avons trouvé deux champignons nouveaux parasites des feuilles de la canne à sucre: *Cercospora whalianensis* nov. sp. et *Leptosphaeria kuangfuensis* nov. sp.

## 1. Cercospora whalianensis Yen et Sun, nov. sp.

(FIG. 1, A-C)

*Description du champignon*

Sur les feuilles du *Saccharum officinarum* (clone F 173) (Graminées), à Kuangfu, Whalian, Formose, leg. Shou-kung Sun (S.K.S. *114*), 12 août 1977.

Macules invisibles. Fructifications amphigènes, invisibles à l'oeil nu, même à la loupe. Stromas absents.

Hyphes externes amphiphylles, sortant de l'ostiole des stomates, brun olivâtre pâle, ramifiées, cloisonnées, 2.0-2.5 µm de large (FIG. 1, A et B).

Conidiophores toujours solitaires, émis latéralement par les hyphes externes, droits ou arqués, brun olivâtre pâle sur toute la longeur, cloisonnés (1-4), 10-45 × 3.0-3.5 µm, avec 0-1 géniculation et à apex arrondi ou coudé et orné d'une ou deux cicatrices conidiennes brun noir (FIG. 1, A et B).

Conidies cylindriques ou filiformes, brun olivâtre pâle, droites ou légèrement arquées, divisées par 1-11 cloisons transversales, à apex arrondi, à base subtronquée et ornée d'une cicatrice brun noir, 20-90 × 2.0-3.0 µm (FIG. 1, C).

### *Caractères taxinomiques*

D'après Butler (1906), Matsumoto et Yamamoto (1934), Yen et Chi (1952), Chupp (1953), Yen, Lo et Chi (1953), Sun (1955) et Yen (1958), il existerait sept espèces de *Cercospora* parasites du *Saccharum* (*C. atrofiliformis* Yen, Lo et Chi, *C. saccharicola* Sun, *C. taiwanensis* Mats. et Yam., *C. kopkei* Krueg., *C. longipes* Butl., *C. rubropurpurea* Sun, et *C. vaginae* Krueg.), chacune d'entre elles montrant des macules caractéristiques et de couleur constante. Par contre, notre récolte ne présente aucune trace de macules. Nous considérons donc ce champignon comme nouveau, avec la diagnose suivante:

Cercospora whalianensis nov. sp. Maculis nullis. Caespitulis amphiphyllis. Stromatibus nullis. Hyphis sterilibus amphiphyllis, ex stomatibus oriundis, septatis, ramosis, pallide brunneo-olivaceis, 2.0-2.5 µm crassis. Conidiophoris amphiphyllis, solitariis, pallide brunneo-olivaceis, ex hyphis sterilibus oriundis, simplicibus, erectis vel curvatis, 1-4 septatis, 0-1 geniculatis, ad apicem rotundatis et 1-2 cicatricibus conidiorum manifestibus, 10-45 × 3.0-3.5 µm. Conidiis cylindraceis vel filiformibus, pallide brunneo-olivaceis, rectis vel leniter curvatis, 1-11 septatis, antice rotundatis, inferne cylindraceis, cellula basali in hilum subtruncatum et atrobrunneum, 20-90 × 2.0-3.0 µm.

Habitat in foliis vivis *Sacchari officinari* (F 173), Kuangfu, Whalian, Formosa, ad Shou-kung Sun (S.K.S. *114*), 12 Aug. 1977.

## 2. CERCOSPORA LONGIPES Butl.

Mem. Dept. Agr. India, Bot. Ser. 1(3): 44, 1906

(FIG. 1, D et E)

Sur les feuilles du *Saccharum officinarum* (clone F 173) (Graminées), à Kuangfu, Whalian, Formose, leg. Shou-kung Sun (S.K.S. *113*), 12 août 1977.

Macules très nettes, uniformément brun ou brun foncé, grisâtres au centre chez les plus âgées, isolées, dispersées sur toute la surface de la feuille, fusiformes ou oblongues, 1-4 × 0.2-1.5 mm.

Fructifications amphigènes, invisibles à l'oeil nu, mais laissant voir, à la loupe, des petits poils noirs correspondant aux fascicules de conidiophores du champignon. Stromas absents.

Conidiophores amphiphylles, sortant de l'ostiole des stomates, en fascicules par groupe de 3-16, simples, érigés ou flexueux, uniformément bruns, cloisonnés (4-15), avec 0-8 petites géniculations, à apex arrondi ou coudé et souvent orné d'une cicatrice des spores brun noir, mesurant 25-135 × 3.0-4.0 µm (FIG. 1, D).

Conides hyalines, obclaviformes, droites ou arquées, divisées par 3-9 cloisons transversales, à apex mince or filiforme (à peine 1.0 µm de diamètre), à base subtronquée et couronnée d'une cicatrice brun noir, mesurant 45-85 × 3.0-4.0 µm (FIG. 1, E).

D'après Butler (1906) et Hughes, Abbott et Wismer (1964), la maladie de "Brown Spot" de la canne à sucre, provoquée par

*Cercospora longipes* Butl. est non seulement commun aux Indes, mais aussi dans les autres pays tropicaux sauf Australie et Formose. Toutefois Dr. W. L. Hsieh a trouvé tout récemment (avril 1977 par correspondance personnelle) l'existance de ce champignon à Formose.

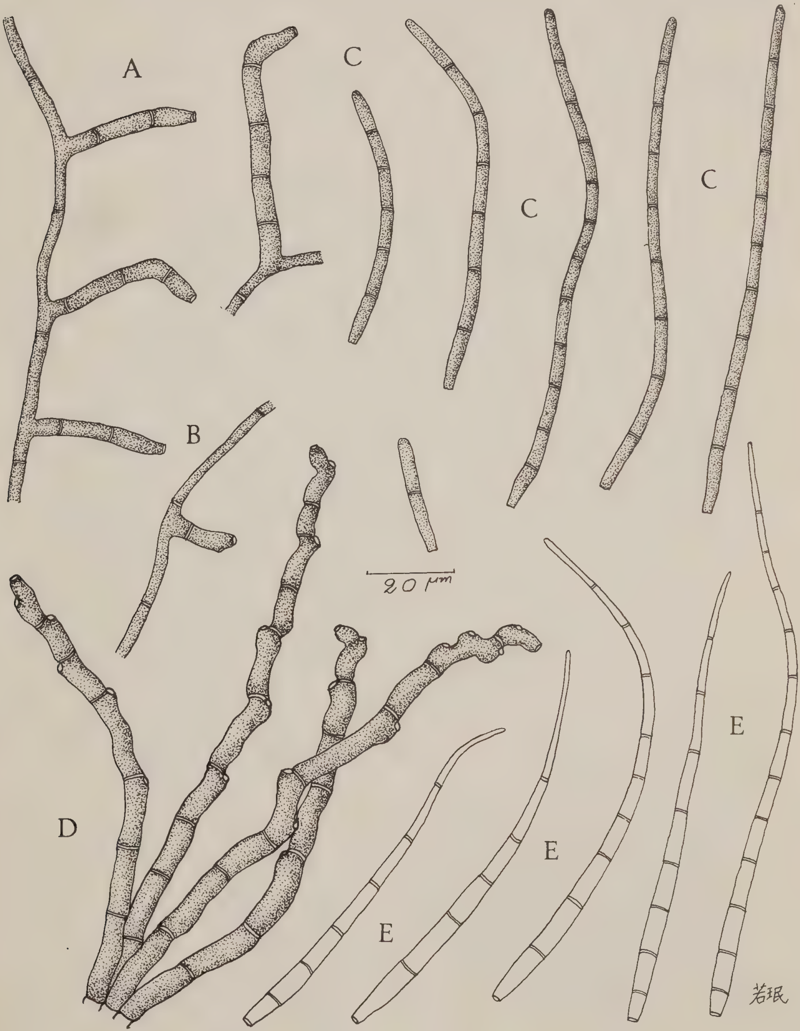

FIG. 1. A-C, *Cercospora whalianensis* Yen et Sun: A et B, Hyphes externes et conidiophores solitaires; C, Conidies. D et E, *Cercospora longipes* Butl.: D, Conidiophores âgés; E, Conidies.

### 3. Leptosphaeria kuangfuensis Yen et Sun, nov. sp.

(FIG. 2)

*Description du champignon*

Sur les feuilles du *Saccharum officinarum* (clone F 173) (Graminées), a Kuangfu, Whalian, Formose, leg. Shou-kung Sun (S.K.S. *113bis*), 12 août 1977.

Périthèces amphiphylles, endogènes, se développant dans les tissus de la feuille, brun noir, isolés, dispersés, globuleux-applatis, à paroi assez épaisse et constituée par 3-6 couches de cellules polygonales brunes; mesurant 80-90 µm de haut sur 123-155 µm de large (FIG. 2, A).

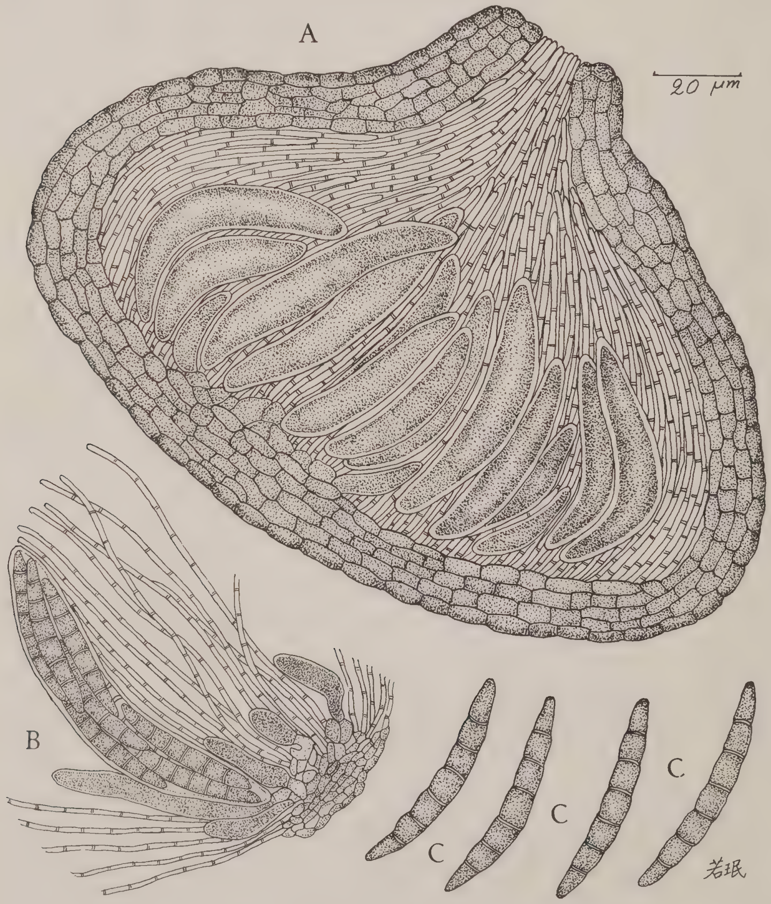

FIG. 2. *Leptosphaeria kuangfuensis* Yen et Sun: A, Jeune périthèce; B, Asques et paraphyses; C, Ascospores.

Asques hyalins, longuement fusiformes, légèrement arqués, à deux extrémités coniques, nombreux, naissant parallèlement à la base de la cavité périthéciale, non pédicellés, octosporés, à membrane lisse et mince (1.0-1.5 µm), 50-58 × 10-12 µm; paraphyses filiformes, simples, hyalines, cloisonnées, très nombreuses, mesurant 1.0-1.5 µm en diamètre (FIG. 2, B).

Ascospores longuement fusiformes, brun pâle, à deux extrémités coniques, droites ou légèrement arquées, divisées par 6 (parfois 7) cloisons transversales, 22-25 × 3.5-4.0 µm (FIG. 2, C).

### *Caractères taxinomiques*

Selon Matsumoto (1952), Yen et Chi (1952) et Hughes, Abbott et Wismer (1964), il existerait deux espèces de *Leptosphaeria, L. sacchari* Breda de Haan et *L. taiwanensis* (Mats. et Yam.) Yen et Chi, parasites des feuilles de *Saccharum officinarum.* Ces deux espèces possèdent des ascospores divisées par trois cloisons transversales, tandis que les ascospores de notre récolte ont 6 (parfois 7) cloisons transversales. Par conséquent, ce champignon est considéré comme nouveau, avec la diagnose suivante:

**Leptosphaeria kuangfuensis** nov. sp. Peritheciis amphiphyllis, endogenis, solitariis, sparsis, atris, glabris, leviter ostiolatis, plano-globosis, pariete membranaceis, fere atrobrunneis, 80-90 µm altis, 123-155 µm latis. Ascis hyalinis, levibus, octosporis, fusiformibus, utrinque conicis, non-stipitatis, 50-58 × 10-12 µm. Paraphysis hyalinis, simplicibus, septatis, tenuis, 1.0-1.5 µm crassis. Ascosporis longofusiformibus, pallide brunneis, utrinque conicis, rectis vel lenissime curvatis, semibiseriatis, 6(-7)-septatis, ad septa lenissime constrictis, 22-25 × 3.5-4.5 µm.

Habitat in foliis vivis *Sacchari officinari* (F 173), Kuanfu, Whalian, Formosa, ad Shou-kung Sun (S.K.S. *113bis*), 12 Aug. 1977.

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# NOTICE

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# NOMENCLATURAL AND TAXONOMIC NOTES ON LASIOBELONIUM, ERIOSCYPHA AND ERIOSCYPHELLA

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## *SUMMARY*

*Lasiobelonium* Ell. & Everh. (1897), of which *L. subflavidum* is the monotype, is a later synonym of *Dasyscyphus* (sensu lato). *L. subflavidum* is a later synonym of *D. borealis*, which in turn is the holotype species of *Belonidium* subg. *Phaeobelonidium.* It is not, as has been suggested, a synonym of *Perrotia flammea.*

*Lasiobelonium* (Sacc.) Sacc. & Syd. (1899) is two years younger than *Lasiobelonium* Ell. & Everh., and hence an illegitimate later homonym. It is doubly illegitimate since when erected at subgeneric rank it included the holotype of the generic name; it is automatically typified by *Belonidium aeruginosum.* A later typification by *L. amoenum* provided Dennis (1962) and Korf (1973, 1977) with a generic concept that now requires a new generic name for at least two of the species. All 8 species referred to *Lasiobelonium* are discussed, and appropriate transfers noted on the basis of type studies. The spelling *Lasiobelonis* is explained.

*Erioscypha* Kirschstein (1938) is lectotypified here with *E. kriegeriana*, and that species is transferred to *Dasyscyphus.* It is congeneric with *D. borealis*, and the generic name is a synonym of *Belonidium* subg. *Phaeobelonidium (= Dasyscyphus).*

*Erioscyphella* Kirschstein (1938) is briefly noted as taxonomically artificial but nomenclaturally available.

## I. LASIOBELONIUM: TWO HOMONYMS

It is necessary to distinguish between two homonymous generic names: *Lasiobelonium* Ellis and Everhart (1897) and *Lasiobelonium* (Sacc.) Saccardo and Sydow (1899).

Let us first examine the status of *Lasiobelonium* Ell. & Everh. In their paper, Ellis and Everhart (1897) record *L. subflavidum* Ell. & Everh. as a new species on *Salix* wood from the state of Washington. Though they did not indicate that this was a new generic name, *Lasiobelonium* does not appear in that rank so far as is known in any of the literature prior to that date. We are thus forced to consider this *a combined description of a monotypic new genus and new species* (International Code of Botanical Nomenclature, Art. 42), since there is no indication whatsoever from where the generic name may have come.

The description of *L. subflavidum* is short by modern standards. Though the Ellis collections are housed at the New York Botanical Garden, Seaver (1951) apparently never examined the material, for he records it in the "Doubtful and Excluded Species" of *Lachnella* with the comment: "The description of this species suggests *Perrotia flammea*." Dennis (1963) reported that: "No apothecia remain on the type collection, but Ellis's notes on the packet include the unpublished information that the ascospores become 1-3 septate. This and the substrate is consistent with Seaver's suggestion that the fungus was *Perrotia flammea*."

I have examined the ISOTYPE material of this species, W. N. Suksdorf *489*, on deposit at WSP, and find that it bears apothecia in a fairly good state of preservation. It is certainly not *Perrotia flammea* (Alb. & Schw. *per* Pers. : Fr.) Boud., but instead is *Dasyscyphus borealis* (Ell. & Holw.) Sacc. (non *D. borealis* K. & L. Holm, Symb. Bot, Upsal. 21(3): 13. 1977, a later homonym), with fusoid, 1- to 3-septate ascospores and asci with a strongly J+ ascus pore. The generic name thus falls into synonymy with *Dasyscyphus* Nees *per* Gray in my sense, and with *Belonidium* Mont. & Durieu *in* Durieu subg. *Phaeobelonidium* Raitviir (1970), which has *Peziza borealis* Ell. & Holw. as its holotype.

Two years after Ellis and Everhart had published their new species (and implied new genus), Saccardo and Sydow (1899) catalogued Ellis and Everhart's species in the Sylloge Fungorum under the generic name "*Lasiobelonium* Sacc." At that point they referred back to the earlier *Belonidium* subg. *Lasiobelonium* Saccardo (1889). They should have written "*Lasiobelonium* (Sacc.) Sacc. & Syd." according to modern nomenclatural methodology.

Presumably Saccardo and Sydow believed that Ellis and Everhart had not published a new, monotypic genus, but instead had described a species within a Saccardoan subgenus that was to be raised to generic rank. For the record, I, too, believe that Ellis and Everhart were well aware of Saccardo's subgenus and that they assigned their new species to that subgenus at generic rank — but that is only a belief, not a demonstrable fact.

Some might wish to argue that Ellis and Everhart's new species is itself not validly published because the generic name *Lasiobelonium* (Sacc.) Sacc. & Syd. was not validly published previously (International Code of Botanical Nomenclature, Art. 43). This would unquestionably be true had Ellis and Everhart described *two* or more species of *Lasiobelonium* without a generic diagnosis; since they described only one, Art. 42 on monotypic new genera necessarily applies, and *Lasiobelonium* Ell. & Everh. has that species as its monotype.

Even if we could convince ourselves that *Lasiobelonium* Ell. & Everh. is invalid, we still could not adopt *Lasiobelonium* (Sacc.) Sacc. & Syd. as Dennis (1962) and Korf (1973, 1977) have done, since Saccardo (1889) made a serious initial nomenclatural error. *Belonidium* Mont. & Durieu *in* Durieu (1848) was originally monotypic, based on *B. aeruginosum* Mont. & Durieu *in* Durieu. Saccardo (1884) had erected the subgenus *Belonidium* subg. *Arachnopeziza* (Fuckel) Sacc. When Saccardo (1889) erected three new subgenera of *Belonidium*, subg. *Eu-Belonidium* [Sacc.], subg. *Lasiobelonium* Sacc., and subg. *Podobelonium* Sacc., he made the fatal error of including the generic holotype species, *B. aeruginosum*, in subg. *Lasiobelonium*.

The correct name for the subgenus of *Belonidium* containing the type species is *Belonidium* subg. *Belonidium* (ICBN, Art. 22), as correctly adopted by Raitvīir (1970). The subgeneric epithet *Lasiobelonium* is not only *superfluous*, but *automatically typified* by *B. aeruginosum* (ICBN, Arts. 7 and 63). The generic name *Lasiobelonium* (Sacc.) Sacc. & Syd. is typified by the type of its basionym, and is thus nomenclaturally tied to *B. aeruginosum*. It is necessarily as illegitimate as its basionym, and cannot be typified by another species, *L. amoenum* (Speg.) Sacc. *ex* Clem. & Shear as was attempted by Clements and Shear (1931) and accepted by Dennis (1962).

Only eight species have been formally treated under the generic name(s) *Lasiobelonium*. I have examined type or authentic material of seven of these, with the following taxonomic conclusions:

1. LASIOBELONIUM AQUILINELLUM von Höhnel (1907): The HOLOTYPE material on deposit at FH shows this to be a member of a new genus typified by *Peziza miniopsis* Ellis *(vide infra,* no. 6). It is illustrated and described in my monograph of the Polydesmieae (Korf, 1978).

2. LASIOBELONIUM AMOENUM (Speg.) Sacc. *ex* Clements and Shear (1931) (ut 'Lasiobelonis'): The HOLOTYPE material at

LP was examined by me in 1950, at which time I concluded that though badly preserved, the specimen might represent *Dasyscyphus apalus* (Berk. & Br.) Dennis, a species known from north temperate areas on Juncaceae, with fusiform paraphyses and finely granulate hairs. Dennis (1962) concluded otherwise: "The type material of this in Spegazzini's herbarium is in poor condition but appears to me to have smooth hairs and filiform paraphyses ...." The type specimen is now in such fragmentary condition that it cannot again be loaned (Irma Gamundí de Amos, *pers. comm.*), and all I can judge on now is the description and a single slide preserved at Kew, made either by Dr. Dennis or by me, of one apothecium in which little can be discerned. I find no granularly roughened hairs, but I do see fusoid structures which I may have earlier concluded were paraphyses. Since I find septa frequently in these, I tend to believe thay are fusoid, smooth hairs. No mature asci are evident, and no ascospores appear to be cut out. I am, therefore, quite unable to conclude whether Dennis (1962) was correct in suggesting that Spegazzini's species is congeneric with *L. aquilinellum* and *L. miniopsis*. Dr. Gamundí de Amos is currently studying the Discomycete flora of Tierra del Fuego, from where this was described on *Rostkovia grandiflora* (Juncaceae). Additional collections should allow an accurate determination of the generic placement of Spegazzini's species. It should be noted that when Clements and Shear (1931) attributed the combination to Saccardo, they also gratuitously respelled *Lasiobelonium* as *Lasiobelonis*, in keeping with their stated procedure: "Names of more than six syllables have been shortened in such a manner as to preserve their identity."

3. LASIOBELONIUM DUMONTII Korf (1977): The HOLOTYPE material at NY has been restudied and proves to be a species of *Polydesmia*. I have transferred it to that genus and illustrated it again in the Polydesmieae monograph (Korf, 1978).

4. LASIOBELONIUM GLOBULARE von Höhnel (1909): The HOLOTYPE specimen (FH: Höhnel *A.5335*) matches perfectly von Höhnel's description. This is a species closely allied to, but apparently distinct from, *Dasyscyphus rhaphidophorus* (Berk. & Curt.) Dennis (1954). It has similarly fusoid but broader and septate ascospores. In the one apothecium I sectioned, I measure the ascospores 31-38 × 4.0-4.4 µm, eventually 3-septate, while von Höhnel, who apparently saw more mature spores, records them as 40-50 × 5.0-5.5 µm, and 5- to 8-septate. It is to be transferred as **Dasyscyphus globularis** (Höhn.) Korf, *comb. nov.* (basionym: *Lasiobelonium globulare* Höhn., Sitzungsber. Kaiserl. Akad. Wiss., Math.-Naturwiss. Kl., Abt. 1, 118: 387. 1909).

5. LASIOBELONIUM LACHNOIDES Rehm (1905): There is, surprisingly, no material under this name in the Rehm herbarium at S. The species was described from Kmet's Hungarian collections. I was sent an AUTHENTIC specimen from the Sydow herbarium at Stockholm, labelled "*Lasiobelonium lachnelloides* Rehm, n. sp.," collected by Kmet in Hungary on one of the cited hosts, collected some years prior to Rehm's publication, and presumably an ISOSYNTYPE. It fits Rehm's diagnosis perfectly. The difference in spelling of the epithets is presumably an error, more likely in publication than on the packet label, for Rehm (1905) wrote: "Lachnellae extus similis ...." The specimen is a collection of *Dasyscyphus borealis* (Ell. & Holw.) Sacc. in excellent condition, and Rehm's species falls into synonymy with it. Rehm correctly noted his species as "proxima Lasiobelonio subflavido Ellis et Ev.," for I identify both as *D. borealis* (*vide infra*, no. 7).

6. LASIOBELONIUM MINIOPSIS (Ellis) Dennis (1962): This species was treated in *Dasyscyphella* by Kanouse (1938) and by Korf (1952) before Dennis transferred it to *Lasiobelonium*. The HOLOTYPE specimen is on deposit in NY. This species now constitutes the type of a new genus, in which *L. aquilinellum* (*vide supra*, no. 1) is a second species, and is treated in detail and illustrated in my monograph of the Polydesmieae (Korf, 1978).

7. LASIOBELONIUM SUBFLAVIDUM Ell. & Everh. (1897): I have discussed the HOLOTYPE and ISOTYPE specimens above in my comments on the taxonomic position of the genus, and my assignment of the species to synonymy under *Dasyscyphus borealis*.

8. LASIOBELONIUM TORRENTIUM Ade & Rehm *in* Ade (1923): I have been unable to locate Ade's herbarium, and no specimen of this is in Rehm's herbarium at S (where the herbarium had already been received in 1919). The description suggests a lanceolate paraphysis-bearing species of *Dasyscyphus*.

## II. ON ERIOSCYPHA

Kirschstein (1938) proposed the generic name *Erioscypha* for a new species, *E. kriegeriana* Kirschst., and four additional species presumably known to him only from the literature. It was proposed as a one-character genus, differing from *Dasyscyphella* Tranzsch. (*i.e.*, filiform-paraphysis species of *Erinella* sensu Saccardo) in having colored ascospores. A holotype species was not designated.

A reinvestigation of the HOLOTYPE specimen of *E. krigeri-*

*ana*, on deposit in B, shows this species, on cone-scales of *Picea*, to be a short-stipitate species of *Dasyscyphus*, anatomically closely related to those species Raitvīir (1970) has ranged in *Belonidium* subg. *Phaeobelonidium*. It is most unfortunately only poorly preserved, but the description by Kirschstein appears to be correct in most particulars. To his observations I can add that the apothecia are xanthochroic, the hairs are smooth below and granularly roughened above the first septum, brown and paler towards the tips, and the asci are J+. I hereby designate this species as the LECTOTYPE of Kirschstein's generic name, since clearly it is the species Kirschstein had most in mind when erecting the genus, and since it agrees well with the generic diagnosis. It should, however, be transferred as **Dasyscyphus kriegerianus** (Kirschst.) Korf, *comb. nov.* (basionym: *Erioscypha kriegeriana* Kirschst., Ann. mycol. 36: 383. 1938).

Of the other four species placed in *Erioscypha* by Kirschstein: *E. miniopsis* (Ellis) Kirschst. has hyaline, coiled to crisped hairs, was treated in *Lasiobelonium* by Dennis (1962) and by Korf (1973, 1977), and is the type species of a new genus (Korf, 1978) discussed above in Part I of this paper; *E. calospora* (Pat. & Gaill.) Kirschst. and *E. subcorticalis* (Pat.) Kirschst. are both hyaline-haired species of *Dasyscyphus* (Dennis, 1954); and *E. cognata* (Pat.) Kirschst. is a synonym of *D. rhaphidophorus* with hyaline hairs becoming buff in age (Dennis, 1954).

The colored-spore character seems to have little significance in this group of fungi. Though the spores of *E. kriegeriana* were described as "initio flavis, postremo brunneis," I find them at most pale yellow, and that perhaps the result of tannins in the cone scales. Saccardo used the terms "lutescentibus," "viridulus," "chlorinis," and "hyalinis, chlorinus" for the spores of the other four species included by Kirschstein. There is no evidence that Kirschstein ever examined material of any of the four. I have never noted colored ascospores in *"E." miniopsis*, and Dennis (1954, 1970) makes no mention of colored spores in his descriptions of the other three species.

## III. ON ERIOSCYPHELLA

The artificiality of Kirschstein's one-character generic concepts is further attested to by his genus *Erioscyphella* Kirschstein (1938). This generic split was proposed for colored-spored species of *Erinella* sensu stricto, *i.e.*, differing from *Erioscypha* in having lanceolate rather than filiform paraphyses. It is again clear that he saw no material, for he acknowledged taking his diagnoses for the two included species from Saccardo's Sylloge Fungorum. Neither *Erioscyphella longispora* (Karst.) Kirschst. nor *E. bambusina* (Bres.) Kirschst. was designated the type of the generic name. Both were treated as brown-haired species of *Dasyscyphus* by Dennis (1954), who made no mention of color in the ascospores. I do not choose to designate a lectotype species here, since depending upon which species is chosen the generic name may have some potential use for those determined to split *Dasyscyphus* into smaller and more manageable genera. Kirschstein's final comment, on the lack of complete information in the Sylloge Fungorum, deserves repetition, for it underlines his unfortunate philosophy of classification: "Da die Angabe der Paraphysen fehlt, so ist es zweifelhaft, ob *Erinella rhabdocarpa* Ellis dieser [*Erioscyphella*] oder der vorbesprochenen Gattung [*Erioscypha*] angehört."

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# NOTES ON CORTICIACEAE (BASIDIOMYCETES) III.

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## SUMMARY

A new genus, Uncobasidium, and the species Uncobasidium luteolum and Byssocorticium efibulatum are described. Uncobasidium is characterized by basidia with an unusual basal hook and B. efibulatum by a total lack of clamps.

UNCOBASIDIUM Hjortst. & Ryv. nov. gen.

Fructificatio resupinata, effusa; hymenio submembranaceo vel byssoideo; systemate hyphali monomitico; hyphis distinctis, tenuitunicatis paulatim crassiusculis oleosis, fibulatis, in subiculo plerumque rectis, in subhymeno passim tortuosis; cystidiis nullis; basidiis clavatis vel suburniformibus, plus minusve constrictis, basibus plerumque biradicatis, saepe uncatis; sporis ellipsoideis vel obovatis, tenuitunicatis, non amyloideis.
Generitypus: *Uncobasidium luteolum* Hjortst. & Ryv.

Fruitbody resupinate, effused, softly membranous or byssoid. Hyphal system monomitic. The individual hyphae distinct, thin or becoming thickwalled, with clamp connections; subicular hyphae usually straight and of uniform diameter; subhymenial hyphae tortuous, in some cases strongly bent. Basidia (pleurobasidia) more or less suburniform, strongly constricted with a hook-shaped appendage, arising in the basal septum, with four sterigmata. Spores ellipsoid to obovate, thinwalled, non-amyloid.

UNCOBASIDIUM LUTEOLUM Hjortst. & Ryv. nov. sp.

Fructificatio semper resupinata, effusa, tenuis, hymenio luteolo, submembranaceo vel byssoideo; margine nusquam perspicuo; hyphis distinctis, tenuitunicatis oleosis, fibulatis, 2,5-4 um latis, in subiculo plus minusve rectiusculis, in subhymenio ubique tortuosis; cystidiis nullis; basidiis clavatis vel suburniformibus, tenuitunicatis, 30 - 50 x 8 um, constrictis, basibus biradicatis, 4 sterigmatibus sporis tenuitunicatis, ellipsoideis vel obovatis, circiter 9 x 6 um, interdum agglutinatis binatim, non amyloideis.

Holotypus: Norway. Troms, Målselv, Dividalen national park on Salix 1976-09-03, H.Solheim No. 1445 (O).

Fruitbody resupinate, effused, normally loosely attached to the substrate, subiculum paler than the fertile part, submembranous to byssoid, in colour usually yellowish, margin indistinct. Hyphal system monomitic, individual hyphae thin thinwalled, 2.5-4 um in diameter, with clamps and refractive oily contents. Basal hyphae straight and of uniform diameter up to 4 mu wide. Subhymenial hyphae 2.5-4 um in diam., more or less distinctly tortuous. Cystidia lacking. Basidia constricted, sinuous, mostly bi-rooted,with a more or less hook-shaped protuberance, with four sterigmata, 30-50 x 8 um. Spores ellipsoid to obovate, sometimes agglutinated in pairs, acyanophilous, nonamyloid and nondextrinoid.

Habitat: On decayed branches and trunks, probably only on deciduous trees.

Distribution: Known from three localities: Type locality (see above), Norway: Akershus, Bærum, Kjørbo, on deciduous wood, 1977-11-06, Nakken 2433 (O).
Sweden: Ångermanland, Junsele par., Åkerbränna nat. park in virgin forest, on Populus tremula, 1970-09-20, Hjortstam 4238 (GB).

The new genus is above all characterized by its unique basidia which typically have a lateral hook or loop extending from the basal part. This hook could be interpreted as a continuation of the basidia-bearing hyphae, but in most cases it seems that its growth has been terminated. However, true pleurobasidia as well as ordinary terminal ones, have been observed. Another remarkable character is the lack of a clamp at a point that normally would be assumed to be the base of the basidium. In most cases it is necessary to search a long distance along the lower hyphal part of the basidium before a clamp is observed. The oily hyphal contents, in shape of sphaerical drops and more irregular elongated bodies, are also a striking feature. Immature basidia have a very dense protoplasm but as the spores are shed they collapse and become completely hyaline.

The type collection is larger and better developed than Hjortstam's collection. In the latter the basidia are

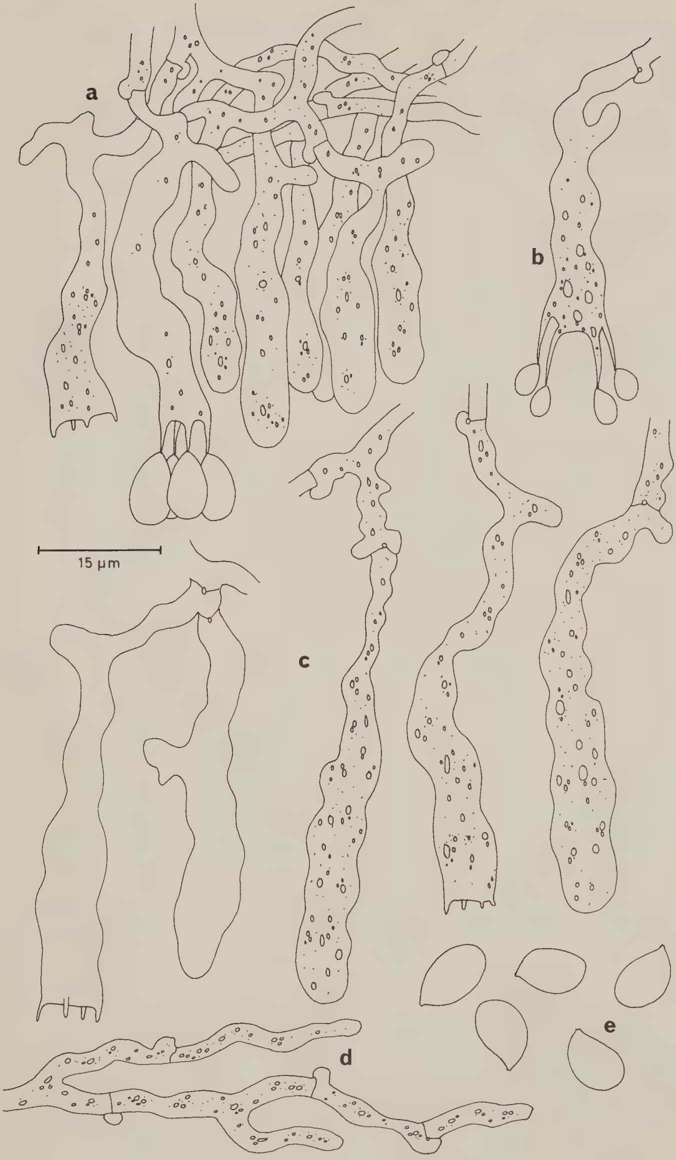

Fig. 1. *Uncobasidium luteolum*, a) section through the hymenium b) young basidium c) mature basidia d) hyphae e) spores. From the type except b: Coll. Hjortstam 4238. Drawing by L.Ryvarden.

younger and shorter. It seems that new basidia continuously develop from the basal hyphae and that they become longer and more tortuous as the thickness of the fruitbody increases. The hyphae in the subiculum are straight and slightly thickwalled, while those in the subhymenium are distinctly bent, tortuous and thinwalled.

It is difficult to point to any related genera. *Radulomyces* typified by *R. confluens* should, according to Oberwinkler (1965:13), have typical pleurobasidia when young. However, we could not confirm this observation. The basidia are distinctly clavate and develop a rather dense hymenium. There are, of course, in the margin of the fruitbody some scattered pleurobasidia. Their occurrence is common in many corticoid fungi and is attbributed to the fact that the first basidium develops laterally on the advancing hyphae. Later ordinary terminal basidia develop from the base of the first basidium.

Further, in *Radulomyces* the basidia have clamps at the base as is the normal case in *Corticiaceae*. Thus, several basidial characters separate the two genera.

BYSSOCORTICIUM EFIBULATUM Hjortst. & Ryv. nov. sp.

Byssocorticio atrovirenti affini sed differt numquam fibuligero.

Holotypus: Sweden. Småland. Kärda par., Åminne on Fagus silvatica 1977-08,31, Hjortst. & Ginns. Hjm. 8685, (GB).

Fruitbody resupinate, smooth, somewhat byssoid, blueish-green. Hyphal system monomitic. Basal hyphae slightly encrusted, ab. 2,5-3 um wide, green coloured, subhymenial hyphae smooth. All hyphae without clamps. Basidia more or less clavate-tubular, 15-25 x 4-5 um with four sterigmata. Spores globose to somewhat obovoid, the wall becoming thick, non-amyloid.

Remarks: Very similar to *Byssocorticium atrovirens* (Fr.) Bond. & Sing. ex. Sing. both macroscopically and microscopically but well distinguished in lacking clamps at every septa.
Both *B. atrovirens* and the closely related *B. pulchrum*(Lund) Christ. have clamp at the base of the basidium and at almost all hyphal septa. However, on the basal hyphae there are some simple septa as well as clamps (cfr. fig. 77 in Eriksson & Ryvarden 1974:182).

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MYCOTAXON

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# SETOSPHAERIA MONOCERAS SP. NOV., ASCIGEROUS STATE OF EXSEROHILUM MONOCERAS

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Recently, *Cochliobolus* states were described for two *Drechslera* species with a non-protruding or 'flush' conidial hilum, *D. chloridis* Alcorn and *D. hawaiiensis* M.B. Ellis (Alcorn 1978). Conidial germination in both species is predominantly polar with basal germ tubes semiaxial, and the primary septum is more or less median in the young conidium (Alcorn, unpubl.). These characteristics would be accepted by some authors (Shoemaker 1959, 1966; Luttrell 1964) as sufficient to assign these two conidial forms to *Bipolaris*. The discovery of their ascal states therefore provides additional evidence supporting the hypothesis that future correlations identified will be *Drechslera-Pyrenophora*, *Bipolaris-Cochliobolus*, and *Exserohilum-Setosphaeria* (Luttrell 1977). A *Setosphaeria* state has been found for *E. monoceras* (Drechs.) Leonard & Suggs, and is reported in this paper.

Leonard and Suggs (1974) established the form-genus *Exserohilum* to segregate those species with protruding conidial hilum, which previously had been accommodated in *Bipolaris* (Shoemaker 1959) or *Drechslera* sens. lat. (Ellis 1971). The three known ascigerous states were transferred from *Trichometasphaeria* to the newly erected *Setosphaeria*, and one additional species described. Of the eight *Exserohilum* species accepted by Leonard and Suggs (1974), four were therefore not known to have ascal state connections. Subsequently Leonard (1976) described a *Setosphaeria* perfect state for *E. rostratum* (Drechs.) Leonard & Suggs emend. Leonard, and placed *E. halodes* (Drechs.) Leonard & Suggs into synonymy with the latter species. This left two species of *Exserohilum*, *E. monoceras* and *E. frumentaceum* (Mitra) Leonard & Suggs, with no known perfect states. The species are considered synonymous by Shoemaker (1959).

*Setosphaeria monoceras* sp. nov. Figures 1-4

Ascocarpi atrobrunnei vel atri, globosi ellipsoidei vel ovoidei, 300-500 µm alti, 260-400 µm lati, dense setosi. Setae atrobrunneae, rectae, multiseptatae, 45-240 µm longae, ad basim 6-15 µm diam., ad apicem 4-7.5 µm diam. Pseudoparaphyses filamentosae, hyalinae, septatae, ramosae, 2.5 -6µm diam. Asci cylindrici vel clavati, bitunicati, 135-245 x 21-35 µm. Ascosporae 1-8, hyalinae, fusoideae vel oblongae, rectae vel curvae, 2-5-(plerumque 3-) septatae, ad septa constrictae, 45-75 x 11-20 µm, tunica tubulosa mucosa usque ad 120 µm longa ultra extremis projectis.

In foliis *Tritici aestivi* in agaro Sachii, 23.ii. 1978, J.L. Alcorn 7804b,BRIP 12567 holotypus, DAR 30601 isotypus.

Stat. conid. *Exserohilum monoceras* (Drechs.) Leonard & Suggs.

Ascocarps dark brown to black, globose to ellipsoidal or ovoid, 300-500 µm high, 260-400 µm diam; sometimes with a short broad beak up to 100 µm high, immersed, erumpent, or superficial on the substrate, uniloculate, densely setose especially on the upper half, fragile. Setae dark brown, paler towards apex, simple, straight, slightly tapered, multiseptate (1-7), basal cell sometimes swollen, 45-240 µm long, 6-15 µm diam. at base, 4-7.5 µm at the rounded apex, accompanied on many ascocarps by long tapering hyphae. Pseudoparaphyses filamentous, hyaline, septate, branched and anastomosing, generally not constricted at septa or only slightly so, cells 9-26 x 2.5-6 µm. Asci cylindrical to clavate, bitunicate, tapered at base, 1-8-(commonly 8-) spored, sometimes shortly pedicellate, 135-245 x 21-35 µm. Ascospores hyaline, fusoid to oblong, straight or mostly slightly curved, 2-5-(usually 3-) septate, constricted at septa, end cells hemispheric to hemiellipsoidal or almost oblong, central cells doliiform, 45-75 x 11-20 µm; with hyaline sheaths visible in water mounts, extending as long tapered cylindrical appendages from each extremity, 50-120 µm long, 7.5-12.5 µm diam. at the midpoint and 5-6 µm near the bluntly pointed tip.

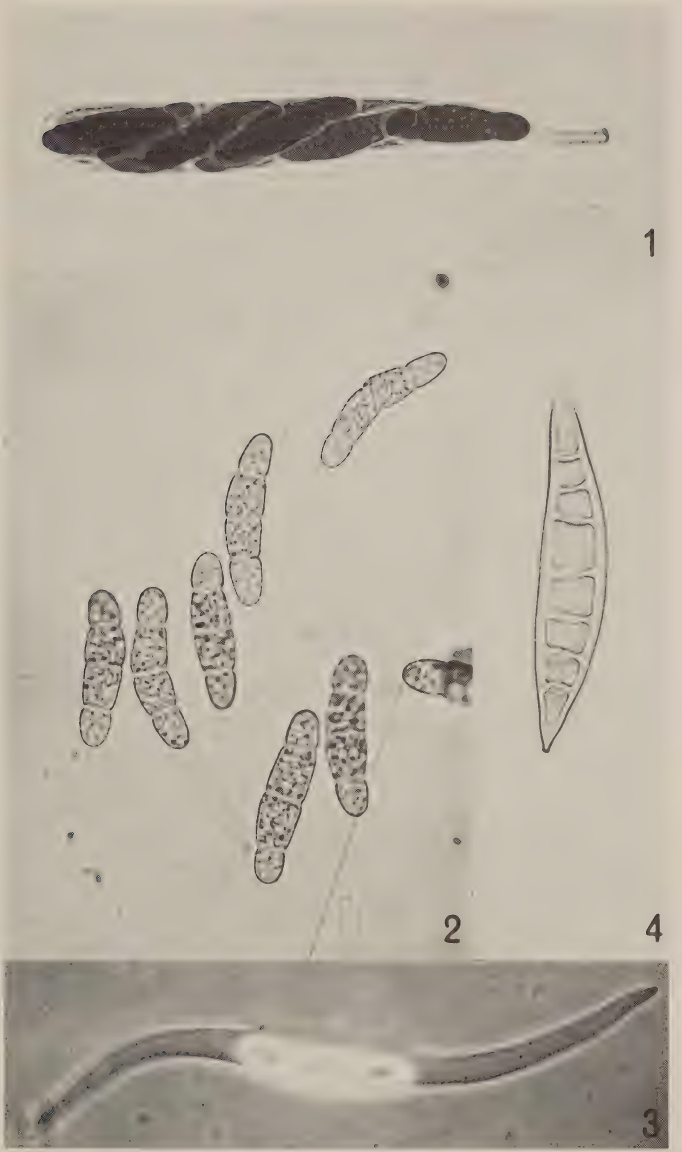
Holotype BRIP 12567 (isotype DAR 30601), from a pairing of single-ascospore cultures 77163-1 and 77163-5, on leaf sheaths of *Triticum aestivum* on modified Sach's agar. These two cultures have been lodged in the following collections: Commonwealth Mycological Institute (IMI 227131,227132), Centraalbureau voor Schimmelcultures (CBS 209.78,210.78), and the American Type Culture Collection (ATCC 36561,36562).

## The fungus in culture

Cultures were obtained from punctiform, purplish-brown leaf spots on *Echinochloa colona* (L.) Link (Biloela Research Station, Queensland, 13 April 1977, coll. M. Vincent). The conidial state on water agar + wheat straw has conidiophores up to 2.5 mm long (after 20 days), mid to dark brown, straight or flexuous, becoming geniculate with fertile nodes well spaced (often in excess of 100 µm apart) and slightly swollen. Conidia are pale to mid olivaceous brown, concolorous, fusoid, straight or curved, apex hemiellipsoidal, base obconic and truncate by a small protruding hilum of the 'plenum' type (Langdon and Gibbs 1971), 67-135 x 15-23 µm, 3-7 septate. These characteristics are sufficient to refer this fungus to *E. monoceras*. Comparison with the type specimen of *Helminthosporium monoceras* Drechs. from BPI (on *Echinochloa crus-galli* (L.) Beauv., Port Washington, N.Y., 20 Sept. 1920) supports the above conclusion concerning the specific identity of the conidial state.

Thirty single-lesion isolates were bulked and used to inoculate plates of Sach's agar supporting autoclaved maize leaf pieces. In addition a single isolate was cultured on water agar + wheat straw, exposed to near-ultraviolet light (12 h day) to stimulate conidial sporulation. Ascocarps developed on both media, but more abundantly on the wheat straw agar. A single ascocarp was crushed in a drop of water, the resulting ascospore suspension streaked over water agar, and single germinated ascospores transferred after 2 h incubation.

Single-ascospore cultures were grown individually and in all possible combinations in pairs, on modified Sach's agar (Leonard and Suggs 1974) supporting sterilized leaf material of maize, wheat,



Figures 1-4. *Setosphaeria monoceras*. 1. Ascus, in lacto-fuchsin 2. Ascospores, in water 3. Ascospore, in water, phase contrast 4. Conidium from single-ascospore culture on water agar + wheat straw (all approx. x400).

or *E. colona*. Single-ascospore cultures grown alone sometimes formed protothecia, but not mature ascocarps. Some paired single-ascospore cultures produced ascocarps with asci and ascospores, indicating that the fungus is heterothallic. The original development of ascocarps in a single culture derived from one lesion may indicate that both mating types were present in the lesion, and mixed in the primary isolate. Occurrence of both mating types of *C. heterostrophus* (Drechs.) Drechs. in a single lesion has been reported by Nelson (1957). Of the three plant substrates tested, wheat appeared to be the most suitable for production of ascocarps, especially leaf sheath from wheat straw.

## Discussion

*Setosphaeria* spp. are all very similar morphologically (Leonard 1976). Comparisons of original descriptions show that *S. monoceras* is most like *S. turcica* (Luttrell) Leonard & Suggs and *S. pedicellata* (Nelson) Leonard & Suggs. Conidial characteristics allow the latter species to be readily distinguished from *S. monoceras*. In *S. turcica*, ascocarps are larger than those of *S. monoceras*, but other morphological features appear to be very similar. It would be necessary to grow both species in parallel under the same conditions to ascertain whether the other small differences are real, rather than apparent. Conidial states are also very similar, especially in culture, but *E. turcicum* (Pass.) Leonard & Suggs has a more distinct change in contour of the basal cell where the 'inconspicuum' type hilum protrudes (Langdon and Gibbs 1971).

## Acknowledgement

I am grateful to the curator, herb. BPI, for lending the type specimen of *H. monoceras* Drechs.

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# *CLADOSPORIUM CASTELLANII* IS A SYNONYM OF *STENELLA ARAGUATA*

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## SUMMARY

Study of the type material of *Stenella araguata* Sydow and *Cladosporium castellanii* Borelli et Marcano, a recently described etiological agent of tinea nigra, has revealed that these two fungi are morphologically identical. *Cladosporium castellanii* is a synonym of *S. araguata.*

*Stenella araguata* was established in 1930 by Sydow to accommodate a phytopathogen of *Pithecolobium* found in Venezuela (4). Later, von Arx (1) transferred *S. araguata* to the genus *Cladosporium* as *C. araguatum.* In 1973, Borelli and Marcano (2) isolated a dematiaceous hyphomycete from a patient with tinea nigra in Venezuela. These authors considered their fungus to represent an undescribed taxon, and subsequently proposed the name *Cladosporium castellanii* (Figs. 1-2). Study of the type culture of *C. castellanii* (IMI 183818) and the syntypes of *S. araguata* (Herb. IMI 15728 and 34905) has revealed that these two fungi are conspecific. Thus, *C. castellanii* is a synonym of *S. araguata.*

*Stenella araguata* Sydow, Ann. Mycol. 28:205, 1930.
= *Cladosporium castellanii* Borelli et Marcano, Castellania 1:154, 1973.

≡ *Cladosporium araguatum* (Sydow) v. Arx, Gen. Fungi Sporul. Pure Culture, 2nd. ed., p. 224, 1974.

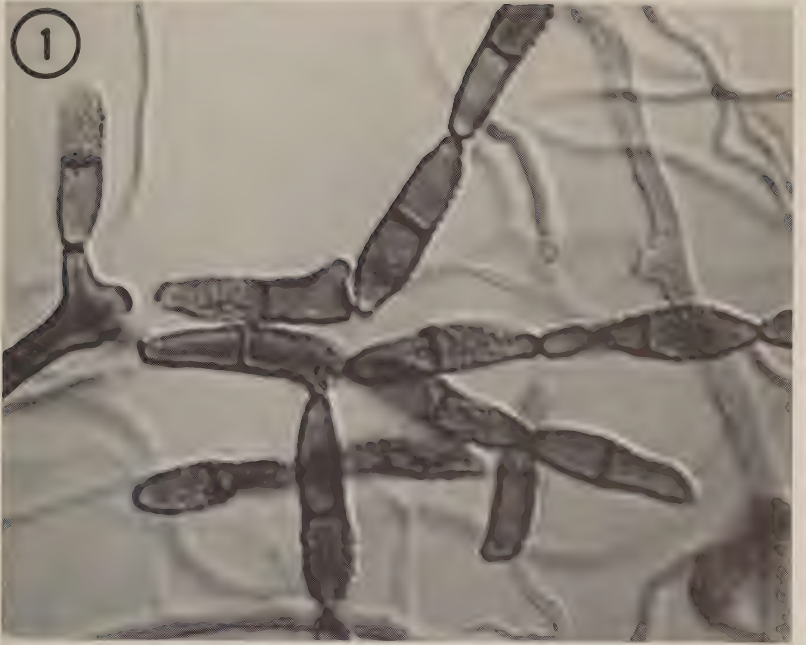
Colonies on Sabouraud dextrose agar and potato dextrose agar are slow growing, reaching a diameter of 10-12 mm in 2 weeks at 25°C and 4-6 mm at 37°C, velvety, mouse gray to olive green, with a central umbo and radiating grooves. The colony reverse is gray to black.

Conidiophores are micronematous to macronematous simple or branched, septate, pale brown to olivaceous brown. Conidiogenous cells are polyblastic, integrated, terminal or sympodial, straight or geniculate, often with a swollen apex, cicatrized, pale brown to olivaceous brown. Blastoconidia are cylindrical to obclavate, mostly cylindrical, catenulate, chains loosely branching, verruculose, trunicate, 0-4 septate, 1 septate predominant, light to olivaceous brown, 2.2-4.8 x 7.0-21.2 (average 3.3 x 12.3) µm.

*Stenella* is similar to *Cladosporium* Link, *Cercospora* Fres., and several other hyphomycetes. This genus can be readily distinguised from the other genera by its typically catenulate, cylindrical, septate, and usually verruculose blastoconidia that arise from simple or sympodial conidiogenous cells. Based upon the description and illustrations of *Biharia,* which was established for *B. vangueriae* by Thirumalachar and Mishra in 1953 (5), *Stenella* and *Biharia* are apparently congeneric (3).

It is beyond the scope of this study to determine whether or not *S. araguata* is an etiologic agent of tinea nigra. *Stenella araguata* is not an uncommon hyphomycete in Venezuela and could simply represent a skin contaminant that was isolated by Borelli and Marcano.

Figures 1-2. *Stenella araguata* (IMI 183818) in Nomarski differential interference contrast microscopy. Fig. 1. Sympodial conidiogenous cell with branching chains of conidia. Fig. 2. Conidia.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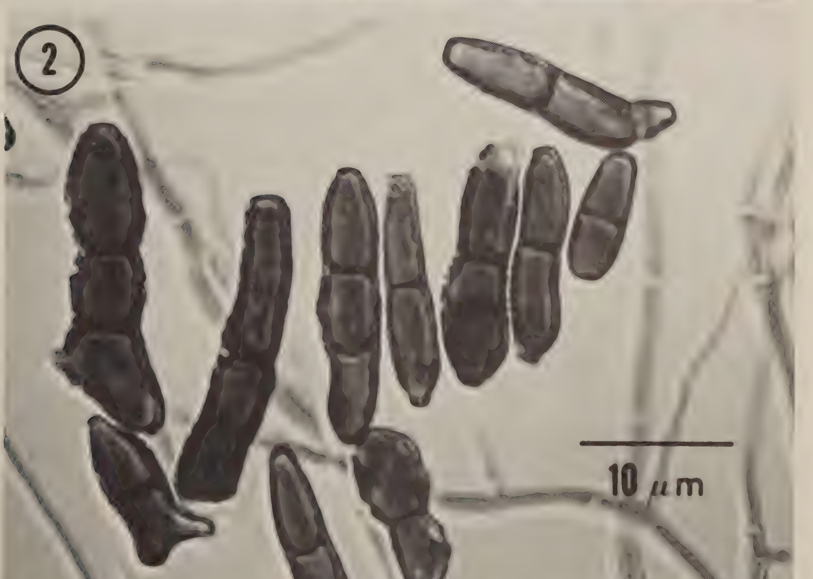
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## ACKNOWLEDGEMENTS

The authors wish to thank Dr. C.J.K. Wang for reviewing the manuscript and Dr. B.C. Sutton for loan of the herbarium specimens.

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# SEPTORIA EXOTICA

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*Scoleciasis atkinsonii* is reinstated as distinctive from *Septoria exotica,* and the two species are characterised in accordance with their types.

Two markedly distinctive pycnidial leaf spot pathogens occur in New Zealand and elsewhere on species of *Hebe*. Inexplicably these two species, *Septoria exotica* Speg. (1880) and *Scoleciasis atkinsonii* Syd. (1924) have been repeatedly confused (e.g. Grove, 1935; Brien & Dingley, 1955; Dingley, 1969). To resolve this confusion herbarium specimens in Herb. LEV and Herb. PDD were examined and cultures were prepared from fresh specimens collected at the Horticultural Reseach Centre, Levin. The two species differed in the appearance of the leaf spot, in the microscopic features of the conidia and in their growth in culture.

*Septoria exotica* forms small lesions mostly about 1-3 mm diam., with pale grey necrotic centre and sharply defined dark margin. The method of conidial formation is obscure but seems to be phialidic as in other typical *Septoria* species. The conidia are quite hyaline, apparently quite smooth, 20-30 µm long and 1 µm wide. In culture this species grows readily on agar, albeit slowly, and colonies develop to about 12 mm diam. in 7 days.

*Scoleciasis atkinsonii* forms larger lesions, 3-8 mm or more in diam., brown (not grey) in colour and less sharply defined with no distinctively coloured margin. The conidial formation is clearly annelidic and the conidia are distinctly coloured yellowish-brown, appear minutely roughened, 25-45 µm long and 2.5 µm wide. In culture the fungus grows hardly at all on agar and colonies are only 1-2 mm diam. in 7 days.

Conidia form in cultures of both species and retain the distinctive features of conidia formed in the host.

The type specimens of both species were examined *(Se. exotica* ex LPS 10595, *Veronica andersonii,* coll. C. Spegazzini, 18 July 1880; *Sc. atkinsonii* ex PDD 968, *V. atkinsonii,* coll. E.H. Atkinson, 24 Oct. 1920) and found to agree with the respective descriptions given above.

The type specimen of *Septoria veronicae* Rob. ex Desm. (ex PC, Desm. Crypt. Fr. 1710, *Veronica hederaefolia*) and another specimen (ex K, Rabenh. F. eur. 361, *V. triphylla*) were obtained and examined. As stated by Grove (1935) this differs in the character of the spot being rather pale and indistinct. The conidia are similar to those of *Se. exotica,* but to resolve the question of synonymy of this name, it will require isolations from fresh specimens of similar leaf spots on herbaceous *Veronica* species.

The type specimen of *Phyllosticta veronicae* Cooke (ex K, Fungi Brit. 615) was also obtained but the label carried a note "fide Townsend" that the host is *Viola hirta*.

Of the specimens received from the PDD herbarium, only two of those on *H. speciosa* (12201, 16373) and two on *H.* sp. (25234, 25455) agreed with *Se. exotica,* whilst three on *H. stricta* (86, 13245, 30382), two on *H. stricta* v. *atkinsonii* (968 type, 1590) and one on *H.* sp. (17393) agree with *Sc. atkinsonii*. All the others (*H. carnea* 12748; *H. gracillima* 21776; *H. marocarpa* 18446, 18596, 30002; *H. speciosa* 12618; *H. stricta* 13035, 25015, 25583; *H.* sp. 12692) except one, bore no pycnidia or sporulation, but instead epiphyllous corky lesions. This is a quite different symptom and there appears to be no evidence that these belong to either *Se. exotica* or *Sc. atkinsonii*. Thus they should be deleted from the New Zealand records (Dingley 1969) of *Se. exotica* until further studies can establish the cause of these symptoms. The one final specimen *(H. salicifolia* 1832) bear perithecia of uncertain identity; it too must be deleted from the New Zealand records of *Se. exotica*. No specimens of *H. elliptica* or *H. obtusata* were seen although recorded (Dingley, 1969) as hosts of *Se. exotica* in New Zealand.

The LEV specimens are as follows: *Se. exotica*, *H. andersonii (? salicifolia* x *speciosa)* 470; *H. franciscana* 'blue gem' (? *elliptica* x *speciosa)* 12864; *H.* sp. 466, 8687. *Sc. atkinsonii*, *H. stricta* 11962, 12743. Those on *H. andersonii* and *H. franciscana* are new records for New Zealand. From the few specimens available it appears that *Se. exotica* may be restricted to *H. speciosa* and its hybrids, whilst *Sc. atkinsonii* is restricted to *H. stricta* and *stricta* v. *atkinsonii*. Such specialization would also mean that *Se. veronicae* is unlikely to be the same species as *Se. exotica*.

The question of whether or not *Scoleciasis* is the appropriate genus for *Sc. atkinsonii* cannot be resolved at present as Dr B.C. Sutton advises (pers. comm.) that the type specimen has not been examined since its initial description. *Phaeoseptoria* might also be considered but Dr Sutton says he has not seen the type of this either.

I thank Dr Sutton and the curators of the herbaria mentioned.

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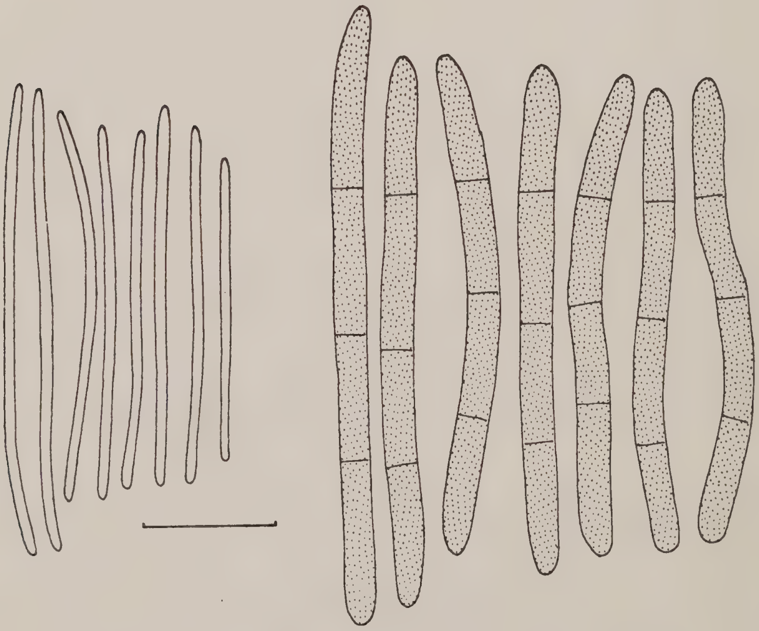

Fig. 1. Conidia from cultures of *Septoria exotica* (LEV 12864) and *Scoleciasis atkinsonii* (LEV 11962). Septa obscure. The scale is 10 µm.

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# THE CASE FOR UROMYCES TRIFOLII

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## SUMMARY

*Uromyces trifolii* (Hedw. f. ex DC.) Fckl is considered to be the most appropriate name for the microcyclic rust of white clover *(Trifolium repens* L.). *U. flectens* Lagerheim is reduced to synonymy. In the absence of its type specimen and because essential details of fungal morphology and host identity are not given in the original description, the name *U. nerviphilus* (Grognot) Hotson is rejected.

## INTRODUCTION

In a series of notes on several rust fungi, Laundon (1975) commented on various *Uromyces* spp. on *Trifolium* and concluded that the best name for the microcyclic telial rust of *Trifolium repens* L. is *Uromyces nerviphilus* (Grognot) Hotson (basionym: *Puccinia nerviphila* Grognot, 1863). The name *Uromyces trifolii* (Hedw. f. ex DC.) Fckl (basionym: *Puccinia trifolii* Hedw. f. ex DC., 1805) was rejected on the grounds that
(i) the type material is almost certainly heterogeneous and one cannot apply Recommendation 7B of the International Code of Botanical Nomenclature (Stafleu, 1972) to the name and thus it is to be rejected under Art. 70 and
(ii) it appears likely that the name has been used persistently in a different sense from that of the original material and in other different senses, and has become a long persistent source of error so is to be rejected under Art. 69.

As Laundon (1975) has pointed out, several authors dealing with the taxonomy and nomenclature of clover rusts have used the name *Uromyces trifolii* for rusts on several different species of *Trifolium*. In particular, the name has been used for the rust of red clover (*Trifolium pratense* L.), now called *Uromyces fallens* (Arthur) Barth. (Laundon, 1975), and for the macrocyclic rust of white clover *(T. repens)*, now called *U. trifolii-repentis* Liro. The two names most commonly used for the microcyclic telial rust of *T. repens* have been *Uromyces nerviphilus* (Grognot) Hotson (1925), based on *Puccinia nerviphila*, and *U. flectens* Lagerheim (1909). Laundon (1975) used the name *U. nerviphilus* for this rust and listed *U. flectens* as a synonym.

This note puts forward an alternative view, proposes a lectotype for *Puccinia trifolii* Hedw. f. ex DC. and suggests that the name *Uromyces trifolii* (Hedw. f. ex DC.) Fckl is the most suitable one to use for the telial rust of *T.repens*.

## DETAILS OF SPECIES

### *Uromyces trifolii*

The microcyclic rust was mentioned first by de Candolle, in Lamarck & de Candolle (1805),as *Puccinia trifolü* Hedw. f. Fung. ined. t.18. The following year it was listed with a brief description as *P. trifolii* by Lamarck & de Candolle (1806). Two years later, the name was transferred to *Uredo* as *U. trifolii* (Lamarck & Poiret, 1808) with reference to the basionym, *Puccinia trifolii*. In the *Flore Francaise* of 1815, de Candolle (1815) listed it as *Uredo trifolii*, with an explanation of why this and some other species were transferred from *Puccinia* to *Uredo*. Although it was listed under *Uromyces* by Léveillé (1847, 1848, from Laundon, 1967), he did not make the new combination in *Uromyces* (Laundon, 1967). This appears to have been done first by Fuckel (1870). All the authors mentioned assumed that this rust occurred on several species of *Trifolium* and, under the name *Uromyces trifolii*, Fuckel (1870) listed several spore stages for it. However, he did list *Uredo trifolii* DC.Fl.fr. VI, p.66 specifically as the 'Fungus teleutosporiferus' indicating that he realised that de Candolle's name referred to a telial rust.

In his original description, de Candolle, in Lamarck & de Candolle (1805) described the rust on stems, petioles and leaf veins. He mentioned that it curled, enlarged and disfigured the organs attacked, and that the clover could be prevented from flowering. The sori were described as oblong to irregular, surrounded by the torn epidermis and containing a reddish-brown spore mass, made up of ovoid, very shortly pedicellate spores. It was found in a shaded meadow near Fontenai-aux-Roses, and was said to occur on three *Trifolium* spp., *T. repens*, *T. filiforme* and *T.hybridum*.

The original material of *Puccinia trifolii* from de Candolle's collections at Geneva has been examined. As Laundon (1975) stated, it consisted of three sheets which were thought at first to represent the three *Trifolium* spp. listed by de Candolle, in Lamarck & de Candolle (1805). An identical telial rust was present on all three sheets. No other spore stage was seen. Sheet 1 was labelled '*Puccinia trifolii* in trifolio repente, Fontenay aux Roses' and Dr. C.E.B. Bonner (Herb. G) indicated that the words 'Fontenay aux Roses' are in A.P. de Candolle's handwriting (Fig.1a,c)..

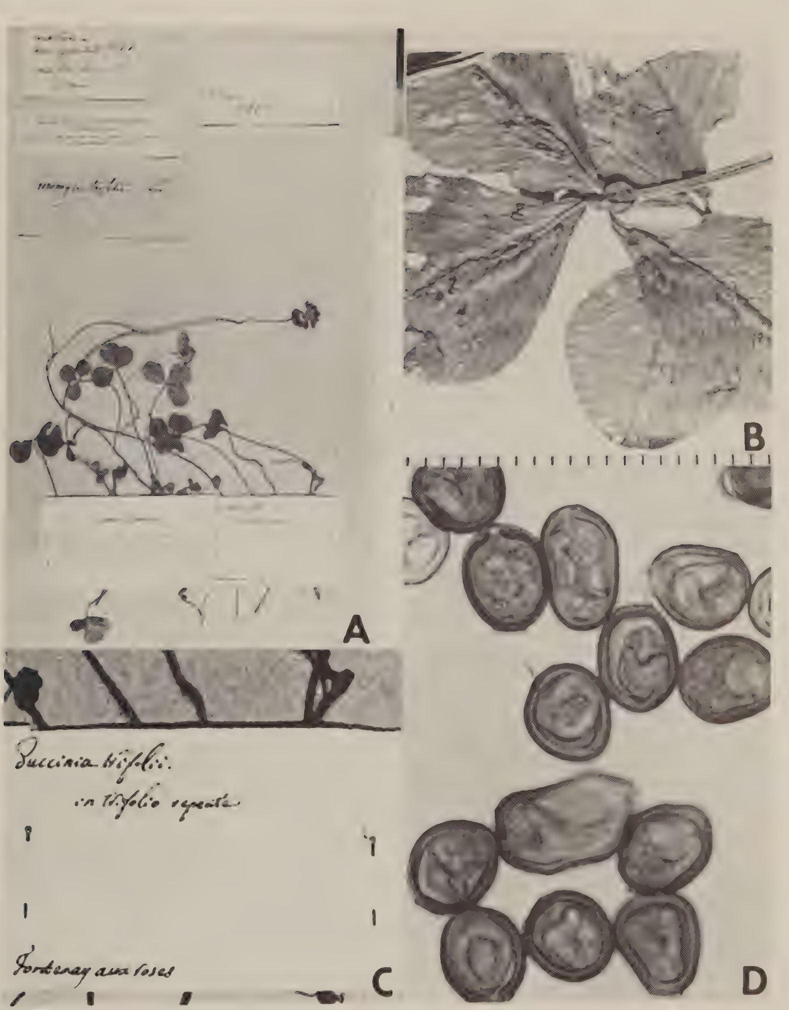
A
B
Puccinia trifolii.
in Trifolio repente
Fontenay aux roses
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Fig.1. *Uromyces trifolii*, lectotype in G. (a) Sheet 1 showing specimen and notes; scale in mms (b) close-up showing telia; scale in mms (c) label on sheet enlarged to show names of rust, host and locality (d) Teliospores x 590 (slide as DAR 28120).

Sheet 1 also has the annotation '*Uromyces trifolii* Lev. and the words '*Uromyces trifolii*' are in Fuckel's handwriting (Dr. C.E.B. Bonner, *in lit.*). From the annotations, Sheet 1 appears to be part of the original collection of *P. trifolii*. On Sheets 2 and 3 there is no indication given of either host or locality, but on vegetative characters the plants appear to be *T. repens* (and not either of the other two *Trifolium* spp. mentioned by de Candolle). On Sheet 3, the words '*Puccinia trifolii* fl.fr.604 *Uredo* ------DC.' are written in de Candolle's hand (Dr.C.E.B. Bonner, *in lit.*) and there is a sketch of two oval shortly pedicellate unicellular spores on which is written the letter 'H' and the note 'Sporae globoso - ovata vel ovata {glabrissima?} pedicello brevi instructa' (square brackets and question mark mine). The author of the sketch and its annotations is not known.

No other de Candolle material under the names *Puccinia trifolii* or *Uredo trifolii* could be found at Geneva (Dr. Bonner, *in lit.*). Enquiries were made at several other herbaria, and at Leiden, a specimen labelled '*Uredo trifolii*'in de Candolle's handwriting was found in Persoon's herbarium. Examination has shown this to be a microcyclic telial rust identical with the Geneva material. The specimen had been examined by Dr. I. Jørstad in 1956, recognised as the telial rust and annotated by him as *Uromyces nerviphilus* (Grog.) Hots. No indication of the host was given but in size, shape and markings, the four leaves present were similar to those of *T. repens*.

In PC, one sheet labelled '*Uredo trifolii*' (but with no other information) was found. This bore a telial rust identical with that seen in the Geneva and Leiden specimens. The author of the handwritten annotation on this sheet could not be determined either at PC or G (Madame J.Nicot, *in lit.*).

Although Laundon (1975) states that the type material of *Puccinia trifolii* is almost certainly heterogeneous, the present investigation indicates that all available de Candolle material of this rust in G and L is perfectly homogeneous, the same microcyclic rust being present in all cases. As far as the host plants are concerned, floral and vegetative features show that Sheet 1 in G is definitely *T.repens*. All other available sheets appear to be *T. repens* as far as can be determined from vegetative material. Although de Candolle listed both *T.filiforme* and *T.hybridum* (in addition to *T.repens*) as hosts of *P.trifolii*, no material of rust on these two species could be found in his collections and perhaps specimens of rust on these hosts were not collected. The α, β and γ notation under which the three *Trifolium* spp. were listed originally does not refer necessarily to specimens but could be merely de Candolle's way of listing the hosts on which he saw the rusts (Dr. Bonner, *in lit.*). As Laundon (1975) has pointed out, *T. filiforme* and *T. hybridum* are hosts of other rust species.

It is thus possible to select a lectotype for *Puccinia trifolii* Hedw. f. ex DC. from the original material and Sheet 1 (Fig.1a), being that sheet in G bearing the specimen marked '*Puccinia trifolii* in trifolio repente' and the locality 'Fontenay aux Roses' is chosen. This sheet carries de Candolle's handwriting, agrees with the original description, locality and one of the three hosts originally listed.

*Uromyces nerviphilus*

*U. nerviphilus* was described originally as *Puccinia nerviphila* Grognot (1863) as follows:-

> "54 - Puccinie des nervures. *P. nerviphila,* n. Sur les deux faces, mais principalement sur la face inférieure des feuilles des trèfles; automne, hiver. R. (Ressemble un peu à la puccinie du vératre (*P.veratri,* Dub.), mais elle affecte la forme allongée de la puccinie du roseau, surtout de sa variété épiphylle, Wallr., elle est cependant d'un brun moins foncé et accompagnée très longtemps de l'épiderme comme dans la puccinie du chardon roland; ce qui distingue principalement, c'est qu'elle suit constamment la nervure principale.)"

In this description, Grognot compared his rust with three other rusts. He said that it slightly resembled *Puccinia veratri* Dub., which occurs on the lower leaf surface of *Veratrum* spp., and has small round or elongated uredinia and similar brown telia (Gäumann,1959,p.864). He said also that his rust had the elongated shape of the reed *Puccinia*, especially of the variety epiphylle Wallr. This refers to *Puccinia arundinacea* Hedw. f.α *epiphylla* Wallroth (1833,p.225), which is probably the same as *P.phragmitis* (Schum.) Korn. or *P.magnusiana* Korn. In both these rusts, and especially in *P. phragmitis,* the sori are often elongated up to several millimetres along the leaf (Gäumann 1959,pp.713,747; Wilson & Henderson, 1966). The telia in these reed rusts are very dark brown to black and Grognot wrote that the sori of his rust were less dark brown than the sori of var. *epiphylla* Wallr. He wrote also that the sori in his species were accompanied for a long time by the host epidermis, and he compared this with 'la puccinie du chardon roland'. This is the rust *Puccinia eryngii* DC.on *Eryngium* spp., whose sori are long surrounded by the host epidermis (Gäumann, 1959, p. 986).

In summary, Grognot's description indicates a mainly hypophyllous rust, with sori on the main vein of the leaf, brown in colour, long accompanied by the host epidermis, and occurring on unspecified clovers.

This limited description does not conflict with what is known of the symptoms produced by the microcyclic telial rust of *T. repens* but no details of the clovers attacked are given nor is there any description of the fungus itself, apart from the colour and arrangement of the sori. It was listed by de Toni (1888) as *Puccinia neurophila* Grognot, with a brief latin summary of Grognot's description and the comment 'species maxime dubia'. It was transferred to *Pucciniola* by Arthur (1921) and to *Uromyces* by Hotson (1925), but neither of these authors listed other than American specimens examined. Both also attributed pycnia and aecia to this rust as well as telia, although Grognot's description does not indicate that he saw two distinct types of sorus. As Laundon (1975) has pointed out, later authors have varied in their treatment of this species, some attributing to it only telia, and others pycnia, aecia and telia.

Detailed attempts to locate the type specimen of *P.nerviphila* Grognot have been unsuccessful. It could not be found amongst the Grognot collections at Autun (AUT) and the Director, M.G. Pacaud, wrote that the specimens corresponding to Grognot's (1863) descriptions in *Plantes Cryptogames-Cellulaires du Département de Saone-et-Loire* are not there. He said that the herbarium collected by Grognot was sent in 1875 to C. Roumeguere. A search for the specimens in herbaria at Paris (P, PC), Montpellier (MPA, MPU), Brussells (BR) and Kew (K) has failed to locate them and the Directors of these herbaria are unable to suggest a possible location for them. They are not amongst the Roumeguere collections at PC. Enquiries in progress at Bordeaux and Rouen have not found them so far. It is of interest that former workers on clover rusts make no mention of having seen the type of *P. nerviphila* Grognot.

As the identity of *P. nerviphila* cannot at present be clarified from an original collection and as the description is insufficient to indicate precisely the identity of both the fungus and its hosts, it is suggested that the name *Uromyces nerviphilus* (Grognot) Hotson (based on *Puccinia nerviphila* Grognot) cannot be used with certainty for any species of clover rust.

*Uromyces flectens*

*U.flectens* Lagerheim (1909) was described on *T. repens* from a collection made at Fjallbacka, Hyppeln, in the Bohuslän region of Sweden. The mainly hypophyllous large, bullate telia were especially common on veins and petioles and the teliospores were described as not distinct from those of *U. trifolii-repentis* Liro.

It has not been possible to locate the type collection from Bohuslän. It is not amongst Lagerheim's collections at S but three other collections made in Sweden and signed 'G. Lagerheim' have been seen from S. A duplicate of one of these (Stockholm, August 1909) from PC has also been examined. The fungus in all collections agrees with the original description and is identical with that seen in the de Candolle specimens of *U. trifolii*. *U.flectens* Lagerheim is thus considered to be a synonym of *U.trifolii* (Hedw. f. ex DC.) Fckl. As Lagerheim's Bohuslän collection could not be found, the specimen from Stockholm, August, 1909 (in S) is chosen as neotype of *U. flectens* Lagerheim.

## USE OF NAMES IN DIFFERENT SENSES

As stated above, Laundon (1975) pointed out that there is no doubt that the name *Uromyces trifolii* has been used in different senses for what are now known to be different species of clover rusts. However, the position with all the names used for rusts on *T.repens* has been confused, and Laundon (1975) also cited examples of usage in different senses for the names *U.nerviphilus* and *U.flectens*. A check of several texts dealing with rusts supported this (Arthur 1912, 1921, 1934; Sydow and Sydow, 1909-1910; Cunningham, 1931; Guyot, 1957; Gäumann, 1959; Wilson and Henderson, 1966).

With *U.trifolii*, some of the confusion dates back to the original description, where three *Trifolium* spp., now known to be hosts of different rusts, were listed (Lamarck & de Candolle, 1805; Laundon, 1975). Fuckel annotated one of de Candolle's specimens as '*Uromyces trifolii*' and probably recognised it as a telial rust, especially as he used the name '*Uredo trifolii* DC.' specifically for the telial stage of *Uromyces trifolii* (Fuckel, 1870). However, he also adopted a more general species concept for this name, and in *Symbolae Mycologicae* he lists rusts on *Trifolium, Medicago, Anthyllis, Onobrychis* and *Lotus* under *Uromyces trifolii*. Three of the exsiccati he listed for these rusts have been examined and all are what are now recognised as distinct species on these hosts (see 'Notes on other specimens' below). Later texts have continued to apply the name *U.trifolii* to various rusts on several *Trifolium* spp.

With *U.nerviphilus* and *U.flectens*, the various uses of the names have been due at least partly to an earlier lack of knowledge of the life cycles of the clover rusts. In some cases, mixed infections with *U. trifolii-repentis* Liro have probably been responsible for confusion (Jørstad, 1967). Moreover, as Laundon (1975) has pointed out, some authors, following Arthur (1921), attributed aecia to these rusts, and listed *U.flectens* as a synonym of *U.nerviphilus*. Sydow and Sydow (1909-1910) and Grove (1913) used the name *U.flectens* for the microcyclic rust and listed *Puccinia nerviphila* Grognot (in Grove (1913) as *P.neurophila* de Toni in Sacc.) as a synonym. Gäumann (1959) treated *U.nerviphilus* as a demicyclic rust and *U.flectens* as microcyclic. As Laundon (1975) has stated "The name *U.nerviphilus* has been the subject of some confusion and error" and ".....that name *(U.flectens)* was equally confused by Arthur (1921, 1934) and others.......".

It thus seems that all names available for the microcyclic rust of *T.repens* have been used to varying degrees in different senses. Under these circumstances, any confusion is not resolved satisfactorily by choosing a name such as *U. nerviphilus* whose original host species is not known and which, in the absence of its type specimen and the paucity of its original description, cannot be properly typified and soundly established. On the other hand, type material of *U. trifolii* and authentic material of *U. flectens* is available and examination of this has shown that they are identical. The descriptions of both are in accord with the fungus present on the specimens, the identity of the host and the symptoms shown. The lectotypification of the earlier described *U. trifolii* establishes the identity of this species on a sound basis and the later described *U. flectens* can be reduced to synonymy.

With regard to the name *U. trifolii*, it is not felt that confusion in the taxonomic literature, even when this is followed to some extent in works on plant pathology, is sufficient reason for rejecting it. It is exactly in the taxonomic literature that one expects diverse opinions to be put forward in an effort to reach a solution. Plant pathological literature has dealt comparatively little with clover rusts and then authors have tended to follow the nearest available taxonomic opinion.

Of the three names available, *Uromyces trifolii* (Hedw. f.ex DC.) Fckl is the earliest and can be accurately lectotypified. The later described *U. flectens* is identical with it. The third name, *U. nerviphilus*, is less precisely described with regard to both fungus and host than the other two, type or authentic specimens cannot be found, and it seems to be the least suitable of the three names to choose within the framework of the International Rules.

## CONCLUSIONS

The following nomenclature is proposed for the microcyclic rust of *T. repens*:-

*Uromyces trifolii* (Hedw.f.ex DC.)Fckl, *Symb.Myc*.p.63,1870.
  ≡ *Puccinia trifolii* Hedw.f.ex DC., *Fl.fr.*2:225,1805
  ≡ *Uredo trifolii* (Hedw.f.ex DC.) DC. in Lamarck & Poiret, *Encycl.meth.Bot.*8: 223, 1808 (also in *Fl.fr.* 6: 66, 1815)
  ≡ *Nigredo trifolii* (Hedw.f.) Arthur, *Result.Sci.Congr. Bot. Vienne* 344, 1906 (from Arthur, 1912)
  = *Uromyces flectens* Lagerheim, *Svensk.Bot.Tidskr.* 3: 36-38, 1909.

Telia only present on leaf blades, petioles and pedicel of inflorescence, reddish-brown, raised, at first covered by the epidermis, later powdery with exposed spores and surrounded by torn epidermal fragments, scattered on both surfaces of leaf but usually larger and more numerous on lower surface, often confluent along the mid-vein, also often abundant and confluent on the petiole below the junction of the three leaflets (Fig.1b), often associated with twisting and distortion, 0.5-1 mm diam., up to 3 x 1 mm on petioles and pedicels. Teliospores (Figs.1d,2,3) golden brown to pale reddish brown, sub-globose, oval, obovate or elongated oval to slightly irregular, a few ovate, unicellular, (18) 22-31 (33) x (15) 17-21 (24) µm, wall apparently double, composed of a very thin hyaline outer

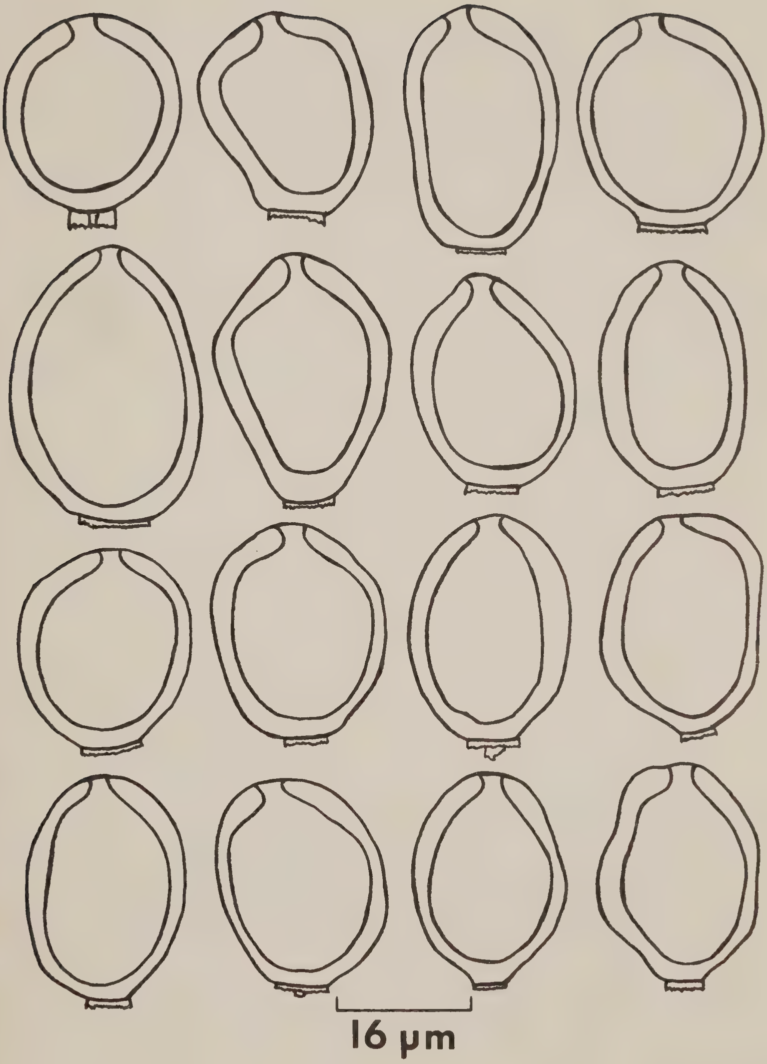


Fig.2. *Uromyces trifolii:* teliospores from sheets in G. From top, four spores each from Sheet 1 (lectotype, slide as DAR 28120), Sheet 2 (upper specimen, slide as DAR 28121), Sheet 2 (lower specimen, slide as DAR 28122), Sheet 3 (slide as DAR 28123).

wall less than 0.5 µm thick and a golden brown inner wall 2-2.5 µm thick, pierced at the apex by a germ pore 2-2.5 µm wide over which the outer wall forms a shallow hyaline papilla. Teliospores attached to stalk at hilum 6.5-9 µm wide with a short length of stalk usually remaining attached to mature spores. Teliospore wall finely roughened (Fig. 3) with small round-topped warts less than 1 µm high and of variable diameter up to 1 µm arranged in a few broken longitudinal or oblique lines, or as curved lines across the spore, or as scattered patches, in some spores more than 50% of the area of one face roughened.

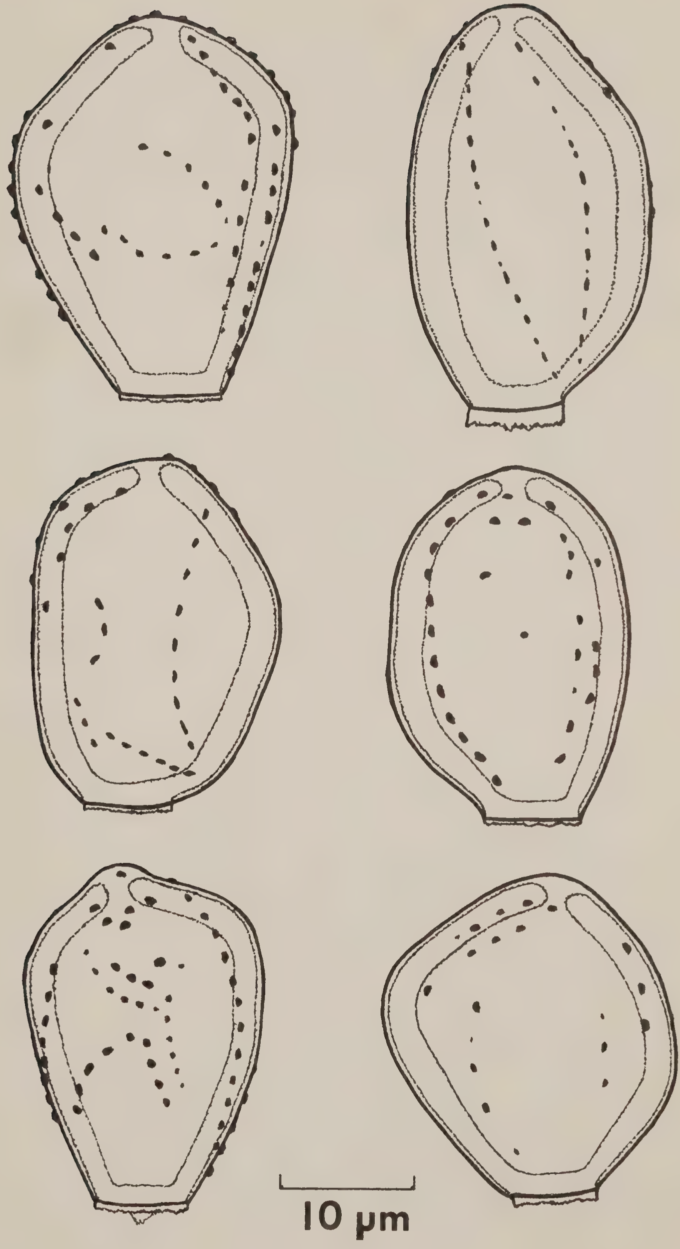
The name *Uromyces nerviphilus* (Grognot) Hotson (syns. *Puccinia nerviphila* Grognot, *Puccinia neurophila* Grognot in de Toni in Sacc., *Pucciniola nerviphila* (Grognot) Arthur) should not be used as the absence of its type and the original description do not allow it to be characterised accurately. Should Grognot's type be found, and his species shown to be the same as *U.trifolii* (Hedw. f. ex DC.) Fckl, then *U.nerviphilus* (Grognot) Hotson would be reduced to synonymy under *U.trifolii*.

The name *U.trifolii* (Alb. & Schw.) Winter in Rabh. (1884) (basionym *Uredo fabae* β *trifolii* Alb. & Schw. 1805) is a later homonym of *U. trifolii* (Hedw. f. ex DC.) Fckl (1870). The rust was described originally on *T.repens* and the name has been used by some authors (Plowright, 1889;Migula, 1925) for a macrocyclic rust on *Trifolium* spp.. The type specimen has not been examined during the present study. Hylander, Jørstad & Nannfeldt (1953) list *Uredo fabae* β *trifolii* Alb. & Schw. as a synonym of *Uromyces trifolii-repentis* Liro (as'(Cast.) Liro'). The sub-specific epithet *trifolii* Alb. & Schw. has no priority over the specific epithet *trifolii* Hedw. f. ex DC. published in the same year (Art.60).

Specimens examined: On *Trifolium repens:* labelled '*Puccinia trifolii* in trifolio repente Fontenay aux Roses', no other data given, Sheet 1 in G (lectotype of *U.trifolii*) (slides as DAR 28120); Stockholm, August 1909, G. Lagerheim, neotype of *U.flectens* Lagerh., in S (slides as DAR 30663), duplicate in PC (slides as DAR 28329); Borgholm, Sweden, 1908, G. Lagerheim as *U.flectens*, in S (slide as DAR 30664); Fjallnas, Sweden, 1897, G. Lagerheim, in S det. I.Jørstad as *U.flectens* (slide as DAR 30665).

On *Trifolium* sp., probably *T.repens* on vegetative characters; no data on Sheet 2 in G (slides as DAR 28121,

Fig.3. *Uromyces trifolii*: teliospores ex lectotype in G showing wall thickness, apical pore and distribution of surface markings (slide as DAR 28120).


10 μm

DAR 28122); labelled '*Puccinia trifolii* fl.fr. 604' Sheet 3 in G (slide as DAR 28123); sheet labelled '*Uredo trifolii*' in de Candolle's writing, in Persoon's Herb. in L 910,264-22 (slide as DAR 27047); sheet labelled '*Uredo trifolii*' in unknown hand, in PC (slide as DAR 28078).

Several other collections of *U.trifolii* from Australia and other countries filed in DAR were also examined during this work.

## NOTES ON OTHER SPECIMENS

Three of the Fungi Rhenani Exsiccati listed by Fuckel (1870) in his description of *Uromyces trifolii* were examined. All were received under the name *Uromyces trifolii* but have been determined as follows:

1. *Fungi Rhenani Exsicc.* 388 ex L
Three species of clover were present on the sheet. They were *T.repens*, *T. montanum* and *T.medium*. The rusts present in each case were *U.trifolii-repentis* Liro II, III (slide as DAR 27049a), *U.minor* Schroet. I, III (slide as DAR 27049b) and *U.fallens* (Arth.) Barth. II (slide as DAR 27049c).

2. *Fungi Rhenani Exsicc.* 389 ex L
The host plant was *Onobrychis sativa* and the rust present was *U.onobrychidis* Bub.II, III (slide as DAR 27050).

3. *Fungi Rhenani Exsicc.* 391 ex L
The host plant was *Anthyllis vulneraria* and the rust present *U.anthyllidis* Schroet. II (slide as DAR 27051).

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# REVUE DES LIVRES

par

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Belgique

COELOMYCETES VI. NOMENCLATURE OF GENERIC NAMES PROPOSED FOR COELOMYCETES, par B. C. Sutton, Mycological Papers n° 141, 253 p., in 8°, 1977. Commonwealth Mycological Institute, Kew, Surrey, UK. Prix £ 7.5o, étranger £ 9.oo, $ 16.2o.

Malgré les progrès réalisés ces dernières années dans la systématique des Coelomycetes, il est certain que la confusion et le statut mal défini de nombreux noms de genre rendent le travail taxonomique fort ardu. C'est pourquoi, l'auteur, en spécialiste du groupe, corrige cette situation en analysant, sur la base de 500 ouvrages consultés, le contenu taxonomique et le statut nomenclatural de 1336 noms de genres de champignons à pycnides et à acervules et de 149 noms de genres de Pycnothyriales. Près d'une moitié de ces noms est, après analyse, à rejeter et un quart des noms est accepté tandis qu'un autre quart reste à évaluer.

THE BLACK YEAST AND ALLIED HYPHOMYCETES, par G. S. de HOOG et E. J. HERMANIDES-NIJHOF, Studies in Mycology n° 15, 223 p., 97 figs., 1 pl., in 8°, 1977. Centraalbureau voor Schimmelcultures, Baarn, Nederland. Prix Hfl 50.-, ann. subscr. Hfl 50.-

Cette publication est un ensemble cohérent de trois articles: *Rhinocladiella* and allied genera, *Aureobasidium* and allied genera, et Survey of black yeasts and allied genera.

Dans le premier article, de Hoog analyse ses observations de 37 espèces et 5 variétés appartenant finalement à 9 genres distincts, suivant les méthodes traditionnelles de taxonomie, et les méthodes modernes de taximétrie et de spectrographie de masse après pyrolyse. Il développe ainsi une méthodique nouvelle pour l'appréciation de l'importance des caractères. Il décrit 2 genres et 7 espèces nouvelles. E. J. Hermanides-Nijhof décrit 14 espèces d'*Aureobasidium* (syn. *Pullularia* et *Kabatiella*) et 4 espèces d'*Hormonema*, ainsi que *Sarcinomyces crustaceus* Lindner. Dans une revision des "levures noires", les auteurs examinent le statut de 46 genres et 242 espèces. Cet ouvrage s'avèrera d'une grande importance dans la taxonomie de ce groupe si confus de champignons levuriformes.

IDENTIFICATION OF WOOD-INHABITING APHYLLOPHORALES IN PURE CULTURE, par J. A. STALPERS, Studies in Mycology n° 16, 248 p., 7 figs., 2 pls., in 8°, 1978. Centraalbureau voor Schimmelcultures, Baarn, Nederland. Prix Hfl 50.-.

L'étude de 96 caractères sur 1500 cultures de 550 espèces de basidiomycètes lignicoles de l'ordre des Aphyllophorales a permis à l'auteur de construire une clé dichotomique d'identification. Celle-ci est conçue sur le modèle de celle de Nobles (1965), mais la dépasse par le nombre de caractères et le nombre des espèces. La clé est à la fois descriptive et diagnostique; elle est rapidement divisée en 7 clés secondaires et occupe la plus grande partie de l'ouvrage (190 pages). Chaque espèce, à laquelle aboutit la clé, est accompagnée d'un code qui reprend les indices des caractères de l'espèce et qui, groupé à d'autres, aurait pu constituer une clé synoptique. L'ouvrage veut être un outil pour l'identification des cultures d'Aphyllophorales, et est excellent quant au fond. Cependant quelques améliorations de détails eut rendu l'outil plus maniable: l'indication de la lettre de référence de chacune des sept clés dans la numérotation de leur dichotomie respective, l'addition d'un index taxonomique des espèces, le soulignement de la référence principale de l'espèce dans l'index alphabétique et enfin la construction d'une clé synoptique qui eut été plus brève. Mais l'utilisateur peut aisément apporter ces améliorations à cet outil dont la valeur est d'ailleurs indéniable.

BIOLOGICAL NOMENCLATURE, par Charles JEFFREY, 2e édition, 72 p., 3 tabl., in 8°, 1977. Publication of the Systematics Association, Edward Arnold Ltd, 15 Hill Street, London W1X 811. Prix £ 1.95 (souple) 4,75 (cartonné).

Ce petit guide a pour but d'introduire le biologiste, qu'il soit mycologue, bactériologue, botaniste ou zoologiste, à la pratique de la dénomination des êtres vivants en accord avec les divers codes de nomenclature. Basé sur des définitions claires, ce guide fait bien la différence entre taxonomie et nomenclature. Dans la description de la démarche nomenclaturale, il distingue clairement les cinq "filtrages" successifs, assurés par les règles de nomenclature, des noms donnés à un même organisme pour aboutir au seul nom correct: la publication, la formulation, la typification, la légitimité et la priorité. Les divers codes de nomenclature n'étant pas identiques, leurs différences sont mises en évidence. D'un prix très abordable, ce livre est à recommander à tout étudiant en biologie.

THE BIOLOGY OF SYMBIOTIC FUNGI, par Roderic COOKE, 282 p., 75 figs. in 8°, cartonné, 1977. John Wiley & Sons Ltd, Baffins Lane, Chichester, Sussex, UK. Prix £ 10.75, $ 21.oo.

Le concept de symbiose, habituellement réservé à une association à profit mutuel entre organismes vivants, est ici étendu à ces relations vitales où aucun partenaire ne tire de bénéfice apparent de l'association et même à ces relations où un des organismes tire tout son bénéfice aux dépends de l'autre. De nombreux exemples sont analysés pour illustrer chacun de ces types de symbiose: symbiose mutuelle, symbiose neutre et symbiose antagoniste, exemples dans lesquels le partenaire du champignon peut être soit un animal, soit une plante supérieure, soit une algue, soit encore un champignon. En chaque cas, les facteurs écologiques, les phénomènes physiologiques, les pertes et profits pour chaque partenaire sont analysés et abondamment documentés.

TERMITES ET CHAMPIGNONS, LES CHAMPIGNONS TERMITOPHILES D'AFRIQUE NOIRE ET D'ASIE MERIDIONALE, par Roger HEIM, 208 p., 56 figs, 7 pls. col. fors texte, in 8°, cartonné, 1977. Boubée Ed., 11, Place Saint Michel, 75006 Paris. Prix FF 160.-.

Dans ce magnifique volume illustré, le Professeur Heim nous présente ses trente années d'observations sur les champignons termitophiles qui l'ont mené d'Afrique noire et de Madagascar à l'Asie méridionale (Inde, Orissa et Bihar). L'ouvrage est plus qu'un regroupement des multiples travaux de l'auteur publiés antérieurement. L'auteur y apporte des idées nouvelles, revoit la position de certaines espèces et de certaines formes et ajoute deux espèces nouvelles, *Termitomyces spiniformis* et *T. lanatus*. Les *Termitomyces* ont sans doute des affinités avec des genres non-termitophiles ni cavernicoles, mais ils ont surtout des caractères qui en font un genre bien défini, la mycotête, la meule, les pseudorhizes et le perforatorium. Des 14 espèces qui font la section des *Eu-Termitomyces*, l'auteur sépare 3 espèces et leurs formes dans une section des *Prae-Termitomyces, T. microcarpus, T. medius et T. perforans*, qui représenteraient divers stades d'une différenciation lamarckienne des champignons termitophiles. Aux nids des termites, sont encore associés des Ascomycètes sur les meules, une Phallale nouvelle dans les chambres, des Agaricales, des Bolétales, des Gastérales et des Aphyllophorales sur les revêtements extérieurs, desquelles cinq espèces sont nouvelles. L'ouvrage n'est pas que descriptif. Il reflète très bien le souci du Professeur Heim de comprendre l'intrigant mystère que recèle la morphologie et la biologie de ces *Termitomyces*.

THE NEMATODE-DESTROYING FUNGI, par G. L. BARRON, Topics in Mycobiology n° 1, 140 p., 57 figs, in 8°, 1977. Canadian Biological Publications Ltd, Box 214, Guelph, Ont. N1H 6J9 Canada. Prix US $ 12.5o frais compris.

Abondamment illustré de plus de 70 microphotographies et de nombreux dessins, ce livre, conçu comme une introduction à la biologie des champignons prédateurs et parasites des nématodes est en fait le premier livre traitant ce sujet comme tel et est très réussi. Des champignons prédateurs, l'auteur décrit la structure et le fonctionnement des organes de capture, réseaux, boutons, anneaux et autres. D'autre part il explore les mécanismes d'infection des nématodes par les champignons parasites, par adhésion, ingestion ou injection. Enfin il analyse les moyens de dissémination et la production de substances attractives et de poisons nématocides qui font de ces champignons un ennemi redoutable des nématodes.

LICHENOLOGY IN THE BRITISH ISLES, 1568-1975, AN HISTORICAL AND BIBLIOGRAPHICAL SURVEY, par D. L. HAWKSWORTH et M. R. D. SEAWARD, 231 p., 22 figs., 17 figs. hors texte, in 8°, cartonné, 1977. The Richmond Publ. Co., Orchard Road, Richmond, Surrey, England TW9 4PD, Prix £ 23.10.

Quatre siècles d'histoire de la lichénologie britannique sont ici condensés, grâce à l'habileté et la science des auteurs, en un texte de 40 pages détaillé et précis. Mais le but du livre est de présenter une bibliographie complète sur les lichens décrits et recensés en Grande-Bretagne. Il fallut dix ans de travail et de persévérance aux auteurs pour retrouver et dépouiller les 2695 ouvrages qu'ils ont recensés. De plus, les références aux flores localesont été compilées comté par comté. A cette bibliographie, les auteurs ont ajouté une liste des 65 herbiers conservant des lichens de Grande-Bretagne, une liste des récolteurs et une illustration des étiquettes représentatives des divers exsiccatae. Cet ouvrage, sans aucun doute, répondra aux voeux des lichénologues.

ANNOTATED INDEX TO FUNGI DESCRIBED BY N. PATOUILLARD, par Donald H. PFISTER. Contribution of Reed Herbarium n° 25, 211 p., in 8°, 1977. Ed. C.F. Reed, 10105 Harford Road, Baltimore MD 21236, USA. Prix $ 5.oo.

Afin d'aménager l'accès aux 50.000 spécimens de l'herbier de Narcisse Théophile Patouillard, acquis en 1927 par le Farlow Herbarium of Cryptogamic Botany, de l'Université Harvard, le Dr Pfister s'est imposé la courageuse tâche d'établir la liste des 111 genres et des 1900 espèces publiées par Patouillard, avec référence au protologue original, mention de l'habitat et de la localité type, avec référence aux spécimens d'herbier et référence à Saccardo avec mention éventuelle de changements nomenclaturaux par ce dernier. L'auteur fort heureusement rappelle dans son introduction que cette oeuvre immense du mycologue français prend toute sa valeur si l'on sait que Patouillard fut un des promoteurs de l'examen des structures anatomiques en vue de la distinction des espèces.

CHECK LISTE OVER DANMARKS HATSVAMPE, par Henning KNUDSEN, 63 p., in 12°, 1977. Publ. Foreningen til Svampekundskabens Fremme, Thorvaldsensvej 40, 1871 København V, Danemark. Prix DKr 15.-.

Liste de toutes les Agaricales récoltées, publiées ou inédites, jusqu'à ce jour au Danemark. Quatorze sources ont été dépouillées, y compris le Supplément inédit à la Flora Agaricina Danica de J. E. Lange et les 2000 aquarelles inédites de F. H. Møller. L'herbier du Museum de Botanique de Copenhague a également été recensé.

DE FUNGI VAN NEDERLAND. DE CLAVARIOIDE FUNGI. AURISCALPIACEAE, CLAVARIACEAE, CLAVULINACEAE, GOMPHACEAE, par R. A. MAAS GEESTERANUS Wetenschappelijke Mededelingen K. N. N. V. n° 113, 92 p., 62 figs., in 8°, 1977. Koninklijke Nederlandse Natuurhistorische Vereniging, G. Houtman, Draafsingel 36, Hoorn, Nederland; Nederlandse Mykologische Vereniging, C. Bas, Joh. Wagenaarlaan 12, Leiden, Nederland.

Parmi les Wetenschappelijke Mededelingen publiées par la Koninklijke Nederlandse Natuurhistorische Vereniging, six fascicules ont été consacrés jusqu'à ce jour aux champignons:
n° 34 De geslachten van Agaricales: Plaatzwammen en Boleten (G.L. van Eyndhoven)
n° 52 Geoglossaceae - Aardtongen (R.A. Maas Geesteranus)
n° 69 et 80 Pezizales I, II (R.A. Maas Geesteranus)
n° 88 Hypogaea (G.A. de Vries) et le présent fascicule. Dans celui-ci, Maas Geesteranus décrit 65 espèces des Pays Bas, appartenant à 10 genres de champignons clavarioides, pour lesquelles il donne des clés et commentaires suceptibles d'en aider l'identification.

THE NORTH AMERICAN CUP-FUNGI. OPERCULATES (1928-1942). INOPERCULATES (1951), par Fred J. SEAVER, 2 vol.378 p. , 23 figs., 74 pls. et 428 p., 150 pls. Réimpression J. Cramer 1978, cartonné toilé. J. Cramer, Lehre, Germany, Lubrecht & Cramer, Monticello, NY. Prix DM 80.- par volume.

Il est heureux que le beau livre de Seaver ait été à nouveau l'objet d'une réimpression. Sans aucun doute il sera encore apprécié par une nouvelle génération de mycologues, pour la qualité des observations et des illustrations qu'il contient. Mais il faudra que ceux-là sachent que ce livre doit être lu à la lumière de la taxonomie moderne des dicomycètes, comme celle définie par Korf dans le Fungi IVA de Ainsworth et Sussman, où les caractères anatomiques ont aujourd'hui une valeur diagnostique ignorée alors.

Bien que les planches photographiques aient perdu un peu de leur finesse à la reproduction, le livre est parfaitement réimprimé, sur bon papier et sous une solide reliure.

THE SPECIES CONCEPT IN HYMENOMYCETES, par H. CLEMENCON, éditeur, Bibliotheca Mycologica n° 61, 444 p., ill. col., in 8°, cartonné, 1977. J. Cramer, FL 9490 Vaduz, Lichtenstein. Prix DM 120.-, par souscription DM 96.-.

Il s'agit ici des actes du Symposium Herbette tenu à l'Université de Lausanne, du 16 au 20 août 1976.

Qu'est-ce que l'"espèce" chez les champignons? est bien une question que tout mycologue se pose et à laquelle bien peu peuvent répondre sans quelque réflexion. Ce fut bien le but de ce symposium, de tenter d'expliciter une notion d'espèce chez les Hyménomycètes qui rallie l' accord des 17 participants, Bas, Bigelow, Blaich, Boidin, Bresinsky, Clémençon, Esser, Horak, Kemp, Kühner, Oberwinkler, Peterson, Romagnesi, Singer, Smith, Thiers et Watling. A travers des exposés sur les Bolbitiaceae, les Boletaceae, les Agaricales, les Aphyllophorales, les Auriculariales, à travers les exemples des genres *Amanita, Clitocybe, Lactarius, Hygrophorus, Pleurotus* ou *Coprinus* et à travers les discussions, s'est bientôt dégagée, non une définition de l'espèce, mais plutôt une image multidimentionelle, génétique, biologique, morphologique, du concept d'espèce chez les Hyménomycètes. C'est dire toute la profondeur et l' amplitude de la question posée.

FUNGORUM RARIORUM ICONES COLORATAE. Pars VIII, par G. BOHUS et M. BABOS, 20 p., 8 pls. col. (n°57-64), 8 figs., in 8°, 1977. J.Cramer FL 9490 Vaduz, Lichtenstein. Prix DM 30.-.

Huitième partie d'un ouvrage qui lentement s'élabore. Commencé en 1966 par Reid, continué ensuite par Schild, puis Moser, l'ouvrage comporte aujourd'hui 252 pages et 64 planches d'aquarelles en couleurs. Cette huitième partie, elle, illustre 7 espèces, *Agaricus cupreo-brunneus, A. eglii, A. elvensis, Coprinus spilosporus, Inocybe aeruginascens, Leucopaxillus lepistoides* et *Tulostoma giovanellae*.

SEXUAL REPRODUCTION IN THE MUCORINAE, par A. F. Blakeslee, 328p., 58 figs. in The Proc. Amer. Acad. Arts and Sciences, 40 (4), 1904, réimprimé dans Bibliotheca Mycologica n° 48, in 12°, 1976. J. Cramer, FL 9490 Vaduz, Lichtenstein. Prix DM 40.-.

L'intérêt de la Bibliotheca Mycologica de J. Cramer est d'offrir au mycologuela réimpression de travaux mycologiques devenus rares. Le travail de Blakeslee sur la reproduction sexuelle des mucorinées est certainement de première importance en ce domaine. En effet, Blakeslee, non seulement mettait en évidence à lui seul la reproduction sexuelle chez autant d'espèces que toutes celles découvertes par ses prédécesseurs, mais il put grâce à l'usage de la culture pure en démontrer l'hétérothallie ou l'homothallie et découvrir le phénomène d'une ébauche d'hybridation entre les souches d'espèces différentes mais de signes opposés, signes (+) ou (-) qu'il put ainsi déterminer pour chacune des souches pures.

INDUKTION DER PRIMORDIENBILDUNG BEI DEM BASIDIOMYCETEN PLEUROTUS OSTREATUS, par Ursula von NETZER, Bibliotheca Mycologica n° 62, 95 p., 8 figs., in 8°, 1978. J. Cramer, FL 9490 Vaduz. Prix DM 25.-

L'induction d'abondantes ébauches de fructifications chez un dicaryon de *Pleurotus ostreatus* est obtenue en culture sur malt agar grâce à l'addition à la culture, à un moment donné du développement, d'une solution azotée (asparagine, glutamine) sous un éclairement de 500 à 1500 lux. La production de primorcia atteint 4000 unités par boîte de Pétri.

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# MYCOTAXON

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# VALIDATION OF THE HARPELLALES AND ASELLARIALES

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The Harpellales and Asellariales, two of four orders currently classified in the Trichomycetes, have been widely referred to in the literature, but apparently have never been validly published. The name Harpellales is based on the Harpellaceae, a family proposed by Léger and Duboscq in 1929 at the time they described *Harpella melusinae*. The ordinal name was first used by Duboscq, Léger and Tuzet in their 1948 monograph to include the Harpellaceae and Palavasciaceae. The latter family is now considered to belong to the Eccrinales (Manier and Lichtwardt, 1968). The inclusion of the Genistellaceae in the Harpellales was proposed by Manier in 1962, and it is with this concept that we offer a Latin diagnosis for the purpose of validating the order. However, Pouzar (1972) correctly pointed out that *Genistella* Léger & Gauthier, the type genus of the Genistellaceae, is a later homonym of *Genistella* Ortega, a genus of the Papilionaceae described in 1773, and proposed the names *Legeriomyces* and Legeriomycetaceae for the fungal taxa. Thus, the Harpellales is presently constituted of two families, the Harpellaceae and Legeriomycetaceae. We are indebted to Dr. Donald P. Rogers for the translation to Latin.

HARPELLALES Lichtwardt & Manier, ord. nov.

Thalli simplices vel ramosi, sporas exogenas, vulgo appendiculatas, scilicet trichosporas, e cellularum genitalium serie gignentes. Zygosporae biconicae.

We also recognize the order Asellariales established by Manier in 1950 which contains the single family Asellariaceae. The family name was validated by Manier and Lichtwardt in 1968 by providing a Latin diagnosis, but the ordinal name has not been validated. Therefore, we now formally erect this order.

ASELLARIALES Manier & Lichtwardt, ord. nov.

Latin diagnosis same as the effectively published diagnosis of the Asellariaceae in Manier and Lichtwardt, 1968, p. 526.

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# THE DISTRIBUTION OF *Nais inornata*, A FACULTATIVE MARINE ASCOMYCETE

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There has been some controversy as to exactly what constitutes a marine fungus. Hughes (1975) in reviewing the literature in this area was inclined to accept the ecological definition of Kohlmeyer and Kohlmeyer (1964) which places primary emphasis on the habit in which a species develops and reproduces rather than the response of the species to various salinities. Although changes in salinity have been demonstrated to be an important factor affecting the distribution patterns of fungi on substrata submerged in estuaries (Schaumann, 1968; Shearer, 1972; Brooks, 1977), changes in salinity along fresh/salt water interfaces are accompanied by changes in surrounding vegetation, turbulence, turbidity, pH, organic and inorganic nutrient levels and biotic community composition. Thus, salinity may not be the sole explanation for why a species occurs where it does. Although a species may grow and reproduce throughout a wide range of salinities in the laboratory, its occurrence in the field may be limited by habitat parameters other than or in addition to salinity. Therefore, an ecological definition of which organisms should be considered marine is indeed valid.

Kohlmeyer and Kohlmeyer (1964) and Kohlmeyer (1974) consider as marine those fungi which grow and reproduce in marine habitats. They divide this group into obligate species which grow and reproduce exclusively in marine or estuarine (brackish water) habitats, and facultative species which occur in freshwater or terrestrial habitats but which can also grow in marine habitats. Hughes (1975) pointed out the importance of a broad view of what constitutes a marine habitat in order to include fungi from a variety of marine and marine-influenced habitats such as estuaries, salt marshes, salt ponds, etc.

Facultative marine species are very difficult to characterize. They may occur along gradients of salinity from freshwater to seawater and from totally submerged marine habitats to emergent terrestrial habitats, or they may be found in widely disparate habitats. With respect to their occurrence along a salinity gradient from 0.0 to 35 °/₀₀, theoretically, fungal species could be facultatively marine in three different ways. A species could occur with the greatest frequency in freshwater habitats and less frequently at low to moderate salinities or it could occur with the greatest frequency in seawater and less frequently at moderate salinities or in freshwater. In addition, a species could occur most frequently at intermediate salinities and less frequently in both seawater and freshwater habitats. From studies made thus far (Hughes, 1975), it appears that few species could be expected to occur with equal frequency in freshwater, estuarine and marine habitats. Although salinity is one of the most common parameters used to characterize the marine habitat, it is again recognized that all the parameters discussed in the first paragraph will vary along with salinity and no attempt is made here to explain the distribution of a species solely on the basis of salinity.

*Nais inornata* Kohlmeyer, a facultative marine species, has been reported from a variety of marine and freshwater habitats. The type specimen was collected from a saltwater "etang" of unknown salinity near St. Cyprien-Plage (Pyrénees Orientales) by Kohlmeyer (1962). G. C. Hughes (1960) collected a fungus (*Melanopsamma* sp.) which Kohlmeyer (1962) considered similar in most respects to *N. inornata*. It was found on pine panels submerged in the Neuse-Newport Estuary and because it occurred in water with a salinity range of 0.0 to 0.7 °/₀₀, Hughes designated it a limnetic species.

A series of collections of N. *inornata* were made from wood test panels which had been placed in cooling towers in Great Britain. It occurred on panels placed in the inlet trough, holding pond, and in the cooling tower at Connah's Quay on the River Dee (Eaton & Jones, 1971a, b; Eaton & Irvine, 1972). The water at this site was described as brackish and attempts were made to keep salinities at low levels by pumping only during low tide and when freshwater runoff increased during the wincer. *Nais inornata* did not occur at a cooling tower at Ince which draws freshwater from the River Dee. Although this water was not saline, it had a higher ionic concentration than the water at Connah's Quay because the system was not purged regularly. Eaton and Jones (1971a, b) linked the appearance of N. *inornata* with brackish water and considered it a marine species. Byrne and Eaton (1972) reported N. *inornata* from test blocks of beech and Scots pine suspended in water that was 10, 50, 75 and 100% of the concentration of seawater and it was also collected from beech panels suspended in seawater tanks at the Marine Biology Station, Hayling Island, Great Britain.

Shearer (1972) collected N. *inornata* from balsa wood blocks submerged in both non-tidal freshwater and brackish-water areas of the Patuxent River, Md. It occurred throughout a salinity range of 0.08 to 17.2 °/₀₀, but with the greatest frequency in freshwater and the lowest frequency at higher salinities. Gessner and Goos (1973a, b) reported that N. *inornata* occurred on *Spartina alterniflora* in a tidal salt marsh adjacent to a tidal creek in Rhode Island with a salinity of 27.0 to 29.0 °/₀₀.

Schmidt (1974) found N. *inornata* on wood, *Phragmites* sp. and conifer cones in the Baltic Sea in waters ranging from 0.5 to 18 °/₀₀. Because this species occurred with great frequency at salinities lower than it had been reported from previously, she suggested that its distribution may be related to a factor other than salinity. She postulates that the high frequency with which it occurred in the β-mesohaline zone (5 to 10 °/₀₀) may be ascribed to the abundance of intertidal plants in this area and she believed that N. *inornata* favored these plants over wood as substrata. *Nais inornata* was also reported from *Juncus* sp. in a saline lake ($MgSO_4$, $Na_2SO_4$) with a salinity of 10.7 °/₀₀ (Davidson, 1974).

We have recently collected *N. inornata* from submerged balsa wood baits and decomposing plant substrates from three different freshwater habitats, the Sangamon River, Illinois and three cypress swamps and a lake in southern Illinois. In addition we have collected it from *Juncus* sp. in a marsh of unknown salinity in Florida, from the Rhode River, an estuary of the Chesapeake Bay, Md., (salinities at the time of collection ranged from 3.3 to 16.6 °/₀₀), from the intake and effluent canals of a power plant on the Patuxent River, an estuary of the Chesapeake Bay (salinities at the time of collection ranged from 3.3 to 9.0 °/₀₀), and from Gott's Gut, a drainage creek from a brackish water marsh on the Patuxent River, Md.

Since *N. inornata* is known principally as a marine fungus, we compared our freshwater collections with the type specimen and protologue. Our collections are identical to the type with one exception. When ascospores from collections in the Sangamon River and Elvira Cypress Swamp were mounted in distilled water, they sometimes bore an irregular gelatinous appendage (Figs. 2-4, 7 & 11) which disappeared soon after the ascospores were released from the perithecium. Appendaged ascospores did not occur in every perithecium examined from each collection. Since appendages seem to be ephemeral, whether they are observed or not may depend upon the age of the perithecium. Other than the occasional presence of appendages, there were no other morphological differences between ascospores from

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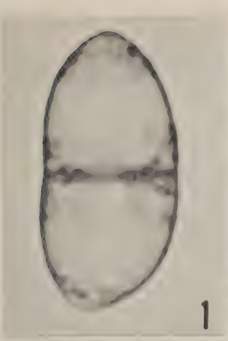
Figs. 1-13. *Nais inornata*. Figs. 1-7, 9-11, 13. Mature ascospores. Fig. 1. Based on the type collection cleared of oil droplets and stained with hematoxylin. X 1,520. Figs. 2-4, 7, 11. Ascospores with appendages. Figs. 2-4 and 7. X 1,100. Fig. 11. X 1,190. Figs. 5, 6, 9, 10, 13. Ascospores without appendages. Note the accumulation of oil droplets at the septa and apices. Figs. 5, 6 X 1,190. Figs. 9, 10. X 1,400. Fig. 13. X 616. Fig. 8. Mature ascus from the type collection. X 634. Fig. 12. Perithecium. X 150.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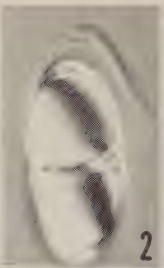
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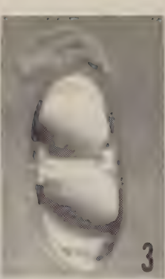
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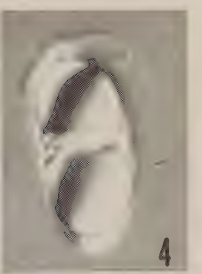
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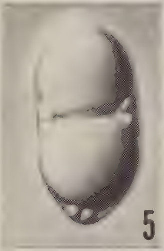
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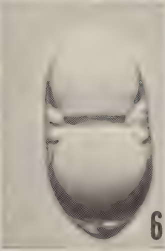
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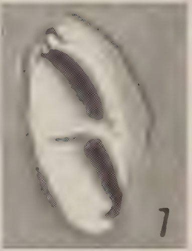
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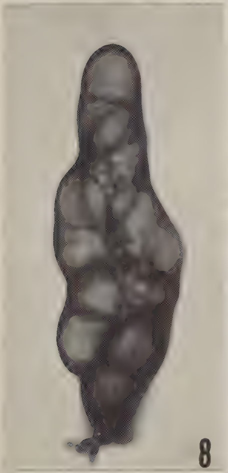
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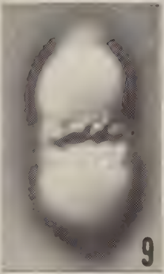
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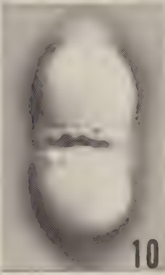
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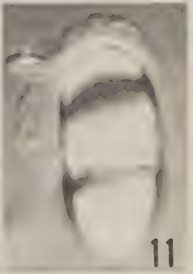
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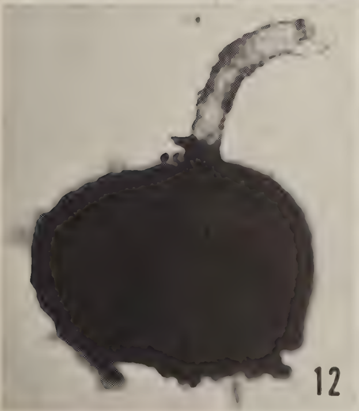
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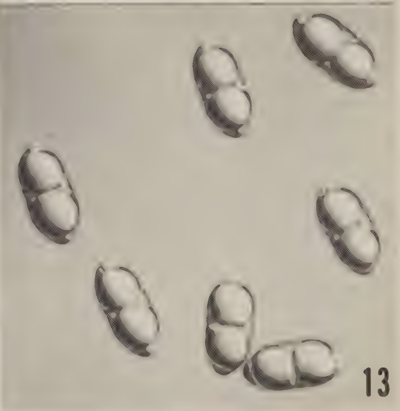
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freshwater collections and ascospores from the type specimen.

The dimensions of ascospores from each of four freshwater collections were compared to those of spores from the type specimen using a t-test. There were no significant differences at the 95% level except in the collection from Pine Hills Swamp. The ascospores of the Pine Hill collection were on the average, 2 μm shorter than those of the type specimen. Because the asci deliquesce at an early stage and are difficult to obtain in large numbers and few perithecia were available in the type specimen, we were unable to test statistically similarities in measurements of these structures. The measurements of perithecia, asci and ascospores of all the populations (freshwater and brackish) which we examined fit within the ranges presented in the type description.

A question exists as to the nature of the refractile structures which occur as a band about the septum of the spore (Figs. 5, 6, 9, & 10). They were described as pore-like markings of uniform size by Johnson and Sparrow (1961) who considered them to be wall sculpturings and not oil droplets. Kohlmeyer (1962) noted that these structures stain orange in Sudan II and clear with alcohol, thus he considered them to be oil droplets. We found that when spores were fixed with alcohol and extracted with chloroform or fixed and extracted with acetone and then mounted in lacto-phenol containing Azur-A, some refractile material disappeared but fine sculpturing on the inner spore wall was distinctly visable in a band about the midseptum and at each end of the spore. It is likely that wall material is deposited irregularly in these regions and possibly lipids accumulate in these sculptured areas. Wall sculpturings on the ascospores from the holotype, prepared and stained with hematoxylin in 1961, are clearly visable. An electron microscopic study is warranted to conclusively demonstrate the presence and nature of these sculpturings. The following description of *N. inornata* is based on our collections from fresh and brackish water.

*Nais inornata* Kohlm. Figs. 1-13

Perithecia globose, black, membranous, ostiolate, immersed or superficial, 240-500 μm diam. Perithecial wall pseudoparenchymatic, composed of thick-walled, dark brown cells. Ostiole periphysate. Neck hyaline or subhyaline, cylindrical simple or branched, 150-1,780 μm long, 25-50 (-69) μm wide at base, tapering to 24-36 (-43) μm wide at apex. Centrum aparaphysate, at first containing hyaline, thin-walled, pseudoparenchymatic cells, at maturity consisting only of a basal layer of asci or asci and catenophyses. Catenophyses hyaline, pseudoparenchymatic, simple or branched, with an apical, basal or lateral attachment. Asci unitunicate, clavate, 8-spored, thin walled, somewhat stipitate, evanescent at maturity, 80-150 x 20-35 μm. Ascospores ellipsoidal, 1-septate, hyaline, with or without constrictions at the septa, with inner wall ornamentations in a band at septum and at each end, oil droplets characteristically accumulating in the regions of wall ornamentation, (19.2-) 21.6 - 26.4 (-29) x 9.6 - 14.4 μm.

Material Examined:

Holotype: In ligno putrido, in aqua salina, in lacu prope "St-Cyprien-Plage" in Gallia sito, proxime mare Mediterranean, 23 May 1961. J. K. No 516 (B) et herb. J. Kohlmeyer. On balsa wood, Maryland, Franklin City, 11 March 1970, C. A. Shearer CS-102-2, ILLS 37219; Calvert County, Rhode River, Smithsonian Research Station, 23 Nov. 1971, C. A. Shearer CS-102-4, ILLS 37218; C. A. Shearer CS-83-10, ILLS 37215; Rhode River at Pier, 12 May 1972, C. A. Shearer, CS-83-11, ILLS 37222; Patuxent River at Solomons Island, 12 Feb. 1970, C. A. Shearer, CS-83-2, ILLS 37225; 2 Feb. 1968, C. A. Shearer, CS-83-15, ILLS 37210; Patuxent River at Gott's Gut, 5 Jan. 1973, C. A. Shearer, CS-83-4, ILLS 37226; Patuxent River at Lower Marlboro, 13 Aug. 1969, C. A. Shearer CS-102-3, ILLS 37217; Patuxent River at Hallowing Point, 12 Feb. 1971, C. A. Shearer CS-83-12, ILLS 37221; 22 Oct. 1969, C. A. Shearer CS-83-16, ILLS 37211; 22 Oct. 1969, C. A. Shearer, ILLS 37220; 12 Feb. 1970, C. A. Shearer CS-83-13, ILLS 37223. Montgomery County, Patuxent River at Triadelphia reservoir, 13 Aug. 1969, C. A. Shearer, CS-83-1, ILLS 37216; Prince Georges County, Patuxent River at Patuxent Wildlife Refuge Center, U.S. Dept. of Interior, 19 Apr. 1968, C. A. Shearer & J. L. Crane, ILLS 34566; 5 Apr. 1968, C. A. Shearer CS-83-17, ILLS 37209; Illinois, Johnson County, Heron Pond Cypress Swamp, 11 Sept. 1975, C. A. Shearer & J. L. Crane CS-83-8, ILLS 37212; 30

March 1974, C. A. Shearer & J. L. Crane CS-83-5, ILLS 37227; Union County, Wolf Lake, 26 July 1975, C. A. Shearer & J. L. Crane CS-83-7, ILLS 37213; 11 Sept. 1975, C. A. Shearer & J. L. Crane CS-83-6, ILLS 37214; Champaign County, Sangamon River at Brigham Station, Mahomet, 21 Oct. 1975, C. A. Shearer & J. L. Crane, CS-83-9, ILLS 37224.

Given the morphological similarity between populations of N. *inornata* from diverse freshwater and estuarine habitats, two hypotheses can be made. One, that N. *inornata* can grow and reproduce on a number of substrates throughout a wide range of salinities in a variety of habitats, and the other, that we are dealing with distinct physiological ecotypes adapted to specific habitats. Which of these hypotheses explains the distribution patterns of N. *inornata* can only be determined by examining and comparing the physiology of isolates from different habitats.

A review of the literature dealing with the occurrences of ascomycetes in freshwater and marine habitats reveals that this species has rarely been reported from seawater (35 °/₀₀). The fact that it has been collected frequently from both disparate freshwater habitats and estuaries but rarely from the sea, suggests that this species was originally a freshwater species which became dispersed along salinity gradients in estuaries. Since colonized woody debris and ascospores are displaced downstream in rivers in a seaward direction, thus providing a constant source of inoculum, it is not unreasonable to expect the establishment of populations in brackish water. Whether or not the establishment of these populations involved some sort of compensation by the fungus either by physiological adaptation or selection for genetically different strains, is not known. We consider N. *inornata* to be a good example of the first type of facultative marine fungus, one which occurs most frequently in freshwater and low salinity habitats and with reduced frequency at higher salinities.

## Acknowledgments

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# VALIDITY OF MUELLEROMYCES VARIISPORUS (DIED.) ULLASA AND KAMATELLA LONGIPEDICELLATA (T. S. & K. RAMAKR.) ULLASA

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*ABSTRACT*

The legitimate names for the two fungi for which Ullasa published new combinations are *Muelleromyces indicus* M. N. Kamat & K. H. Anahosur and *Kamatella variispora* (Died.) comb. nov., respectively.

Publication of the binomial *Muelleromyces variisporus* (Died.) Ullasa (1971) for the ascomycete occurring on the foliage of *Syzygium cuminii* (L.) Skeels in Coorg Forests, Mysore State, with the autorities indicated, created a nomenclatural tangle that must be clarified. The new combination was, and is, contrary to article 63 of the International Code of Botanical Nomenclature (Stafleu *et al.*, 1972): "... it was nomenclaturally superfluous when published..."; "as circumscribed by its author" (Ullasa) the taxon "included the type of a name ... which ought to have been adopted under the rules." Ullasa cited *Muelleromyces indicus* Kamat & Anahosur (Anahosur, 1968) as a synonym. The description of *M. indicus* was the first complete and acceptable one published for this diapothaceous fungus. By publishing this new and independent description, automatically (even though probably unknowingly) the older binomial, *Diplodia variispora* Died. in H. & P. Sydow & Butler (1916), was rejected as a *nomen confusum* (Art. 70, Stafleu *et al.*, 1972) and consequently was not available subsequent to 1968 as a basionym for any ascomycete.

The concept of priority in regard to clarification of a *nomen confusum* versus rejection has been presented elsewhere (Thyr & Shaw, 1964). The principle of priority in regard to rejection of a *nomen confusum*, even when this is done unknowingly, is equally applicable and does not violate any rule in the Code.

Secondly, we believe Ullasa's "choice was based upon a misinterpretation of the protologue" and "was made arbitrarily" (Art. 8, Stafleu *et al.*, 1972). Diedicke, in assigning the fungus to *Diplodia*, clearly indicated his intent to describe a Fungus Imperfectus with two different types of conidia — not an unknown phenomenon in the Fungi Imperfecti. He accurately described pycnidia (not perithecia) and conidiophores ("sporophoris"), not asci. In fully describing the two types of spores he found, those now known to be ascospores of *Muelleromyces indicus* were described first. Ullasa erred in arbitrarily selecting the spores described under "1" (Sydow *et al.*, 1916) and ignoring everything else in the protologue.

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Finally, the procedure proposed by Ullasa is not in compliance with the second paragraph of Art. 9: "If it is later proved that such a type ... contains parts belonging to more than one taxon, the name must remain attached to that part *(lectotype)* which corresponds most nearly with the original description" (Stafleu *et al.*, 1972).

A name or epithet that is contrary to the rules (actually contrary to any single rule) is illegitimate (Art. 6, Stafleu *et al.*, 1972). *Muelleromyces variisporus* (Died.) Ullasa is illegitimate on the basis of the information presented above. Consequently, and conjecture as to whether this combination is in accordance with or contrary to Article 59 (Stafleu *et al.*, 1972) is superfluous. However, since article 59 is the basis for Ullasa's acceptance of *Muelleromyces variisporus*, we offer the following opinion. Ullasa obviously attempted to eliminate from the protologue of *Diplodia variispora* Died. all reference to the structures comprising the imperfect state and to leave only the spores now known to be ascospores of *Muelleromyces indicus* attached to the epithet *"variispora."* This was apparently done in an attempt to comply with paragraphs 3 and 4 of Art. 59, but, since it was done after 1 Jan. 1967, and since Ullasa published a new combination [*Muelleromyces variisporus* (Died.) Ullasa], not a new name, we conclude that *M. variisporus* is also contrary to Article 59 (Stafleu *et al.*, 1972).

Ullasa cites the 1956 edition of the Code (Lanjouw *et al.*, 1956). However, there are no significant changes in any of the articles involved between the 1956, 1966, and 1972 editions of the Code, in so far as these articles apply to this nomenclatural problem.

Consequently, we assert that the legitimate and correct name for the diaporthaceous ascomycete in question is *Muelleromyces indicus* M. N. Kamat & K. H. Anahosur in K. H. Anahosur (1968).

The legitimate and correct name for the associated imperfect state also needs clarification. Having utilized *Diplodia variispora* Died. as the basionym of his new combination, *Muelleromyces variisporus*, Ullasa turned to *Diplodia longipedicellata* T. S. & K. Ramakrishna (1950) as the basionym for the new combination, *Kamatella longipedicellata* (T. S. & K. Ramakr.) Ullasa (1971).

We believe the correct, and much more logical, procedure would have been to clarify the status of *Diplodia variispora* Died. in H. & P. Sydow & Butler (1916) in exactly the opposite way from that chosen by Ullasa. By the genus designation, by the description of "Pycnidiis" (not perithecia) and of conidiophores, it is obvious that Diedicke intended to describe a fungus imperfectus, not an ascomycete. Thus, the obvious "discordant elements" (Art. 70, Stafleu *et al.*, 1972) are ascospores, not all the other structures described by Diedicke!

*Diplodia variispora* is a *nomen confusum* for which it is easy to select, on the basis of protologue and the type, the component elements that should be associated with a Fungus Imperfectus and to eliminate the single structures described (ascospores) which are not part of the imperfect state. Prior rejection of this name as a basionym for the ascomycetous element does not make the name unavailable for the elements comprising the Fungus Imperfectus. As we interpret the Code, there is no rule which prevents, even after the publications by Anahosur (1968) and Ullasa (1971), the selection of "a satisfactory type" (Art. 70; also 8 and 9, *op. cit.*) for the Fungus Imperfectus involved in Diedicke's protologue. Therefore, we propose Kamatella variispora (Died. in H. & P. Sydow & Butler *pro parte, ascosporis exclusis*) *comb. nov.* as the correct name.

The synonymy for both the ascigerous fungus and the imperfect fungus are given below. It should be noted that although we, too, find these two fungi constantly associated, there is still no conclusive proof that they are states of one and the same fungus.

MUELLEROMYCES INDICUS M. N. Kamat & K. H. Anahosur in K. H. Anahosur, Experientia 24: 849. 1968.

Misapplication: *Muelleromyces variisporus* (Died.) Ullasa, *sensu* Ullasa (1971).

KAMATELLA VARIISPORA (Died.) *comb. nov.*

Basionym: *Diplodia variispora* (Died. in H. & P. Sydow & Butler, Ann Mycol. 14: 196. 1916. *(Pro parte, ascosporis exclusis.)*

Synonyms: *Diplodia longipedicellata* T. S. & K. Ramakr., Proc. Indian Acad. Sci. 32(B): 78. 1950.
*Botryodiplodia variispora* (Died.) Zambettakis, Bull. Soc. Mycol. Fr. 70: 319. 1954.
*Kamatella indica* Anahosur, Bull. Torrey Bot. Club 96: 207. 1969.
*Kamatella longipedicellata* (T. S. & K. Ramakr.) Ullasa, Bull. Torrey Bot. Club 98: 3. 1971.
*Muelleromyces variisporus* (Died.) Ullasa, Bull. Torrey Bot. Club 98: 3. 1971 *(excl. specim. et descr.)*.

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# REVISIONARY STUDIES IN THE ARACHNOPEZIZOIDEAE: A MONOGRAPH OF THE POLYDESMIEAE

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## *SUMMARY*

The genus *Polydesmia* Boud., based on *P. pruinosa* (Jerd. *in* Berk. & Broome) Boud., a tiny white discomycete occurring primarily on pyrenomycetous stromata, is shown to belong to the Hyaloscyphaceae. Two species previously referred to the genus are excluded: *P. rosae* Killermann, on the pith of *Rosa* canes, is a *Propolomyces*, possibly *P. farinosus; Polydesmia herbicola* Svrček is transferred to *Hyaloscypha*. A previously undescribed Macaronesian species occurring principally on the fallen fruits and peduncles of mimosas (*Acacia* spp.) in Madeira and on the fallen capsules of *Eucalyptus globulus* in Madeira and the Canary Islands is described as *Polydesmia fructicola*. *Lasiobelonium dumontii* Korf, a Venezuelan species on a fern rachis, proves also to be a *Polydesmia*, and is transferred to that genus. Since *Lasiobelonium* must be abandoned in the sense adopted by recent authors, *L. miniopsis* (Ellis) Dennis is designated the type of, and *L. aquilinellum* v. Höhn. is transferred to, a new genus, *Parachnopeziza*. The genus *Eriopezia* (Sacc.) Rehm is reinvestigated, and a new species, *E. samuelsii* on *Gahnia* from New Zealand, added; *E. microspora* (Kanouse) Dennis is referred to *Lachnellula*, and *E. roseolo-tincta* Svrček is a pyrenomycete, *Nectria carnea* Desm. The three genera, *Polydesmia*, *Parachnopeziza* and *Eriopezia*, constitute the Polydesmieae, a new tribe in the new subfamily Arachnopezizoideae. Keys to the genera of the Polydesmieae and to the seven known species are provided. A new Macaronesian species, *Pezicula linda*, which may easily be confused with *Polydesmia*, is described in an appendix.

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## *POLYDESMIA: A HISTORICAL SURVEY*

Boudier (1885) erected *Polydesmia* for a single species, *Helotium pruinosum* Jerdon *in* Berk. & Broome, and placed the genus in the family 'Caloriacés.' From other genera of this family with highly branched, delicate paraphyses (*Epiglia* Boud., *Calloria* Fr., *Corynella* Boud., and *Mniacea* Boud.) *Polydesmia* was distinguished by its furfuraceous hymenium. Boudier's later treatment (Boudier, 1907) is essentially similar, and the genus remained monotypic until two species were added, *P. rosae* Killermann (1935) and *P. herbicola* Svrček (1967).

Saccardo (1889) transferred Jerdon's species to *Pseudohelotium* Fuckel (1870), but to avoid homonymy with *Ps. pruinosum* (Wallr.) Sacc., he coined the new name, *Pseudohelotium jerdonii*, for *Helotium pruinosum.* Saccardo did not accept Boudier's genus *Polydesmia* in any of the volumes of the *Sylloge Fungorum.* Saccardo's wide concept of *Pseudohelotium* is no longer accepted, and many authors (von Höhnel, 1923; Dennis, 1956, 1960, 1968; Korf, 1973) treat it as monotypic, based on *Peziza pineti* Batsch *ex* Pers., a species on needles and cones of *Pinus* and not considered closely related to *Polydesmia pruinosa.*

Rehm (1891) also failed to recognize Boudier's genus, and treated Jerdon's species as *Belonidium pruinosum* (Jerd. *in* Berk. & Broome) Rehm. He considered *Belonidium* Mont. & Dur. *in* Dur. to be a genus of the family 'Mollisieae,' Abtheilung Eumollisieae. The generic name *Belonidium* has also been used in a wide sense by various authors. Since when the genus was founded it had only one species, the generic application must follow the taxonomic position of that species, *B. aeruginosum* Mont. & Dur. *in* Dur. That species is now either assigned to *Dasyscyphus* Nees *ex* Gray (Dennis, 1962) or accepted as a separate genus of the Hyaloscyphaceae (Raĭtviĭr, 1970). *Polydesmia pruinosa* has little in common with *B. aeruginosum.*

Rehm (1912) transferred the species of Jerdon to *Belonium*

Sacc., another genus of the Mollisioideae, and credited the combination to von Höhnel. This is doubtless a result of von Höhnel's (1909) statement, "In der Gattung *Belonidium* stehen in Rehm's Discomycetenwerk einige Arten, die richtig zu *Belonium* gehören, so *B. pruinosum* (Jerd.) und *B. subcarneum* Rehm." That these initials stand for *Belonidium,* not *Belonium,* is almost certain: neither in the index to new names in this fascicle, nor in the index to the first 1000 *Fragmente,* do the combinations in *Belonium* appear. The correct citation for the species in *Belonium* is *B. pruinosum* (Jerd. *in* Berk. & Broome) v. Höhn. *in* Rehm. No modern author has suggested any close relationship between *Polydesmia* and *Belonium.*

Killermann (1935) accepted the genus *Polydesmia* in the (tribe ?) Pezizelleae Rehm *emend.,* and described a new species, *P. rosae* Killerm., which I exclude (below) from the genus. Svrček (1967) described another new species, *P. herbicola* Svr., but did not indicate any position for the genus in the classification; this species I also exclude (below) from *Polydesmia.*

## *SOME MORPHOLOGICAL OBSERVATIONS ON THE TYPE SPECIES OF POLYDESMIA AND A NEW TAXONOMIC PLACEMENT OF THE GENUS*

The pruinose hymenium which distinguishes *Polydesmia pruinosa* from most other minute discomycetes is the result of highly branched paraphysis apices extending well above the ascus tips and not being immersed in a gel. Such paraphyses have been termed *propoloid* by Sherwood (1977a). Not only the propoloid paraphyses, but also the fairly large, often bent ascospores of *P. pruinosa* recall similar structures in the Phacidiaceous genus *Propolomyces* Sherwood (1977b) [a genus better known as *Propolis* (Fr.) Fr. non *Propolis* (Fr.) Corda]. One other common genus has some species with a pruinose hymenium, *Pezicula* Tul. & Tul. (Dermateaceae, Peziculoideae). One Macaronesian species, *P. linda* Korf, easily confused with *Polydesmia,* is described below in an appendix to this paper.

Though early authors either described the apothecia of *Polydesmia pruinosa* as glabrous, or failed to mention any hairs, Massee (1895) described the apothecia as "often surrounded by more or less evident white hyphae." Boudier (1911) noted the apothecia to be "finement furfuracés ou tomenteux en dehors," and these comments are almost exactly repeated by Grelet (1948). Migula (1913) is apparently the first to provide a description of the hairs on the apothecia: "äusserlich besonders am Rande in faserartige, etwa 30 µ lange, 3 µ breite, unregelmässige Hyphen auslaufend." Von Höhnel (1923) also saw the hairs: "in hyaline, 1 bis 1.5 µ dicke, kürzere oder bis 40 µ lange, stark wellig oder schraubig verbogene Haare endigen." I am able to confirm their observations (FIG. 14), and am convinced that the apothecial structure of hyaline, somewhat glassy-walled hyphae, often so short-celled as to appear as textura prismatica or textura angularis, giving rise to hairs, makes assignment of this species to the Hyaloscyphaceae wholly appropriate. It is possible that Svrček (1967) considered *Polydesmia* to belong to the Hyaloscyphaceae, since he described a new species between diagnoses of two other new species, both of which were assigned to genera of the Hyaloscyphaceae. If so, he appears to have been the first to adopt what I consider to be the correct family disposition of the genus.

In the two recent classifications which have treated *Polydesmia* (Dennis, 1960, 1968; Korf, 1973), the genus has taken an isolated position. Dennis refers it to a monogeneric 'tribe' Polydesmioideae of the Helotiaceae (the -oideae ending, however, is that of a subfamily). Korf refers it to a monogeneric subfamily, Polydesmioideae, of the Leotiaceae. Neither the 'tribe' nor the subfamily have been given formal Latin diagnoses. I propose (below) a new tribe, Polydesmieae, to accommodate this genus and two others within the Hyaloscyphaceae.

## *TWO OTHER SPECIES OF POLYDESMIA: A NEW SPECIES FROM MACARONESIA AND LASIOBELONIUM DUMONTII*

It was the discovery of an apparently undescribed species of *Polydesmia* from Madeira and the Canary Islands that prompted my reinvestigation of the genus and its type species. Unlike *P. pruinosa,* normally found (parasitic ?) on the stromata of various pyrenomycetes (particularly *Diatrype, Valsa, Hypoxylon,* and *Apiosporina*) or on wood or bark in which one can usually find immersed pyrenomycetes, the new Macaronesian species occurs on fallen pods and peduncles of mimosas (*Acacia* spp.) and on the fallen capsules of *Eucalyptus globulus* Labill. that show no sign of pyrenomycete invasion. More rarely it occurs on wood or bark. The hosts are not related botanically, but both were introduced and both are characterized by gums. The apothecia are tomentose like those of *P. pruinosa,* and the species is formally described (below) as *P. fructicola* Korf. The ascospores are much narrower in *P. fructicola* than in *P. pruinosa.*

Only a year ago I described a new species, *Lasiobelonium dumontii* Korf (1977), on an unidentified fern rachis from Venezuela. This, like *P. pruinosa* and *P. fructicola,* has tiny apothecia which tend to fuse together, and a pruinose hymenium (overlooked when I described the species), as well as a dense covering of irregular to coiled hairs as in those species. There seems no doubt that this species is also congeneric with *P. pruinosa,* and it is formally transferred (below) as *P. dumontii* (Korf) Korf. Its most distinctive character is the 4-spored asci.

## *PARACHNOPEZIZA, A NEW GENERIC NAME FOR LASIOBELONIUM SENSU DENNIS*

In the preparation of my keys to the genera of discomycetes (Korf, 1973), I restudied the only species of *Lasiobelonium* known at all well to me, *L. miniopsis* (Ellis) Dennis. I had wrestled with the placement of this species much earlier (Korf, 1952), since it clearly resembles *Arachnopeziza* in a number of characters, differing primarily in having apothecia arising from a tiny stalk directly inserted into host tissue (instead of sessile apothecia borne on the hyphae of an evident subiculum), and in its ascospores with many more than 7 septa. Often there is no evidence of a subiculum, but occasionally an obvious hyphal weft can be seen on the surface of the bark. Since these hyphae do not directly bear the apothecia, I used the term 'false subiculum' to refer to them in a footnote to the key to *Arachnopeziza* species (Korf, 1952: 152), where I referred to this species as *Dasyscyphella miniopsis* (Ellis) Kanouse. By the time I prepared my keys to the genera (Korf, 1973), I accepted *Lasiobelonium* in Dennis's (1962) sense (and specifically for *L. miniopsis*), placed for the first time in the Arachnopezizeae despite the lack of a 'true' subiculum.

Dennis (1962) accepted the invalid typification (see Korf, 1978) of *Lasiobelonium* (Sacc.) Sacc. & Syd. by Clements & Shear (1931) with *L. amoenum* (Speg.) Sacc. *ex* Clem. & Shear. He placed the genus for the first time in the Hyaloscyphaceae, and accepted two additional species, *L. aquilinellum* von Höhnel (1907) and *L. miniopsis,* a new transfer to the genus. Of these, *L. amoenum* remains an almost unknown entity (Korf, 1978). Dennis quite correctly concluded that *L. aquilinellum,* fully and correctly described by von Höhnel, is congeneric with *Peziza miniopsis* Ellis (1881). Both species have a small stalk directly inserted into the host substrate, crisped to coiled hairs, very similar asci and paraphyses, but differ in substrate and number of ascospore septa. Both are composed throughout of hyaline cells, and both have a scanty subiculum (or 'false' subiculum as I previously termed it). Neither can be comfortably accommodated in *Arachnopeziza* Fuckel (1870) in my sense (Korf, 1952), which has completely sessile apothecia borne on the subicular hyphae, and I conclude they represent a good genus more closely allied to *Eriopezia* and to *Polydesmia* than they are to *Arachnopeziza*. Since *Lasiobelonium* (Sacc.) Sacc. & Syd. is unavailable (Korf, 1978), a new generic name, *Parachnopeziza*, is proposed (below) for them.

## *ARACHNOPEZIZOIDEAE, A NEW SUBFAMILY WITH TWO TRIBES, POLYDESMIEAE TRIB. NOV. AND ARACHNOPEZIZEAE EMEND.*

Nannfeldt (1932) proposed dividing the Hyaloscyphaceae into three tribes, Lachneeae, Hyaloscypheae, and Arachnopezizeae. Since no formal diagnosis had been provided, Korf (1952) erected the Arachnopezizeae Nannf. *in* Korf in his monograph of the tribe. Since that time, the family has had added to it the subfamily Trichoscyphelloideae Nannf. (Dennis, 1963; Korf, 1973); the original three tribes constituted the subfamily Hyaloscyphoideae in my treatment (Korf, 1973). The question as to whether the Arachnopezizeae should even be attached to the Hyaloscyphaceae has been raised by Raĭtviĭr (1970), who excluded the genera from his treatment. Though I am in agreement with Raĭtviĭr that the Arachnopezizeae are not typical members of the Hyaloscyphaceae, I still prefer to range the genera in that family on the basis of similarity in tissues, hairs, and asci. The glassy-walled excipular cells are markedly different, I agree. I am therefore prepared to recognize the group of genera as a subfamily of the Hyaloscyphaceae, and propose to two tribes within the new subfamily. One of these is the new tribe Polydesmieae, consisting of three known genera, *Polydesmia*, *Parachnopeziza*, and *Eriopezia*. The second tribe is the Arachnopezizeae *emend.*, consisting of the genus *Arachnopeziza*, and possibly also the genus *Velutaria* Fuckel (1870) *emend.* Saccardo (1884, 1889), which is the correct generic name for *Tapesina* Lambotte (1887) *emend.* von Höhnel (1923), the name I used in my monograph (Korf, 1952; see in this regard Korf, 1953a, 1953b). The removal of *Eriopezia* from the tribe requires a slight emendation of the description.

## ARACHNOPEZIZOIDEAE Korf, subfam. nov.

Hyaloscyphacearum subfamilia, apotheciis in subiculo sparso vel denso portatis, exciPulo ex textura angulari vel prismatica parietibus aspectu vitri (refractivis) praedita consistente. Typus: *Arachnopeziza* Fuckel.

## ARACHNOPEZIZEAE Nannf. *in* Korf, Lloydia 14: 139. 1952, *emend.*

The tribe now excludes *Eriopezia* (Sacc.) Rehm, one of the original genera.

## POLYDESMIEAE Korf, trib. nov.

[= Polydesmieae Dennis, tribus of Helotiaceae, British Cup-fungi p. 90, 1960, *nom. nud.*, ut 'Polydesmioideae;' British Ascomycetes p. 143, 1968, *nom. nud.*, ut 'Polydesmioideae.']

[= Polydesmioideae Korf, subf. of Leotiaceae, *in* Ainsworth *& al.*, The Fungi 4A: 298. 1973, *nom. nud.*]

Arachnopezizoidearum tribus, apotheciis breviter stipitatis, stipite in substratum inserto, subiculo denso vel sparso circumdatis, pilis frequenter spiralibus vel crispatis. Typus: *Polydesmia* Boudier.

## *KEYS TO THE GENERA AND SPECIES OF THE POLYDESMIEAE*

1. Apothecia gregarious, surrounded by a dense subicular mat; excipular cells dark brown, giving rise to hyaline hairs; ascospores 0- to 1-septate.................... *ERIOPEZIA* 2
   2. Ascospores 0-septate, without a sheath; apothecia on wood.............................. *Eriopezia caesia*
   2. Ascospores 1-septate, sheathed with gel; apothecia on sedges........................ *Eriopezia samuelsii*
1. Apothecia scattered on a scarcely visible subiculum; excipular cells hyaline, glassy-walled, giving rise to hyaline, coiled or crisped hairs; ascospores 1- to 15-septate.......................................................... 3
   3. Apothecia tiny, often coalescent; hymenium pruinose by virtue of propoloid paraphyses; ascospores fusoid, uniseriate or biseriate, 1- to 3-septate.. *POLYDESMIA* 4
      4. Asci regularly 4-spored, ascospores 1- to 3-septate; on ferns.................. *Polydesmia dumontii*

4. Asci 8-spored (rarely with a few 4-spored asci).... 5
   5. On pyrenomycetes or wood in which pyrenomycetes are imbedded; ascospores 11-21 × 3.3-5.1 µm, eventually 3-septate......... *Polydesmia pruinosa*
   5. On fruits and peduncles (rarely on wood or bark); ascospores 5.9-11.0 (-16.8) × 1.5-2.2 (-2.9) µm, 1-septate (very rarely 2- or 3-septate in rare, 4-spored asci)............. *Polydesmia fructicola*

3. Apothecia tiny or easily visible with the naked eye, not coalescent; hymenium not pruinose; ascospores filiform, in a parallel bundle, 3- to 19-septate..... *PARACHNOPEZIZA* 6
   6. Apothecia on bark, small; hymenium red; ascospores 15- to 19-septate... *Parachnopeziza miniopsis*
   6. Apothecia on fern leaves, tiny, totally white; ascospores 3-septate..... *Parachnopeziza aquilinella*

ERIOPEZIA (Saccardo) Rehm *emend.* von Höhnel, Akad. Wiss. Wien Sitzungsber., Math.-Naturwiss. Kl., Abt. 1, 132: 116. 1923.

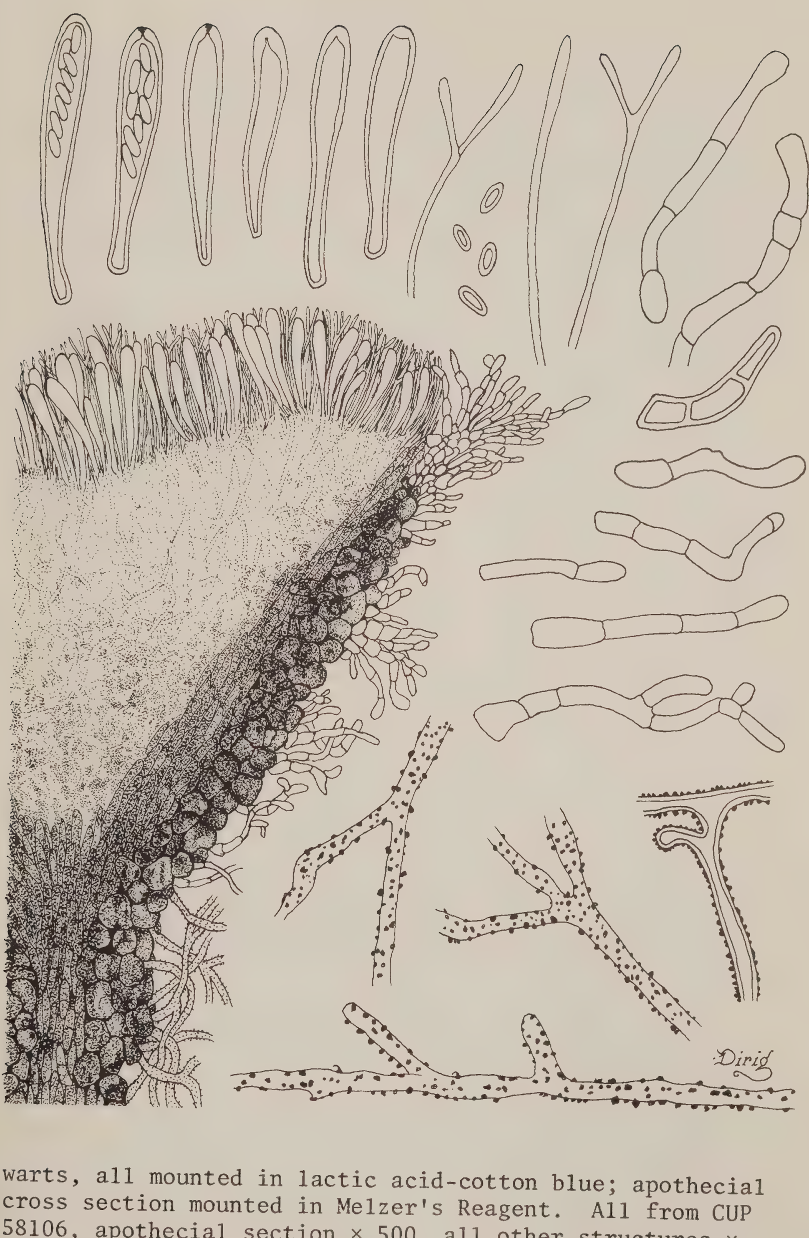
(For synonymy, see Korf, 1952.)

1. ERIOPEZIA CAESIA (Pers. *ex* Gray : Fries) Rehm *in* Winter, G. & H. Rehm [eds.], Pilze, Dr. L. Rabenhorst's Kryptogamen-Flora von Deutschland, Oesterreich und der Schweiz, ed. 2, 1(3) [Lief. 38]: 693, 696. 1892. FIG. 1

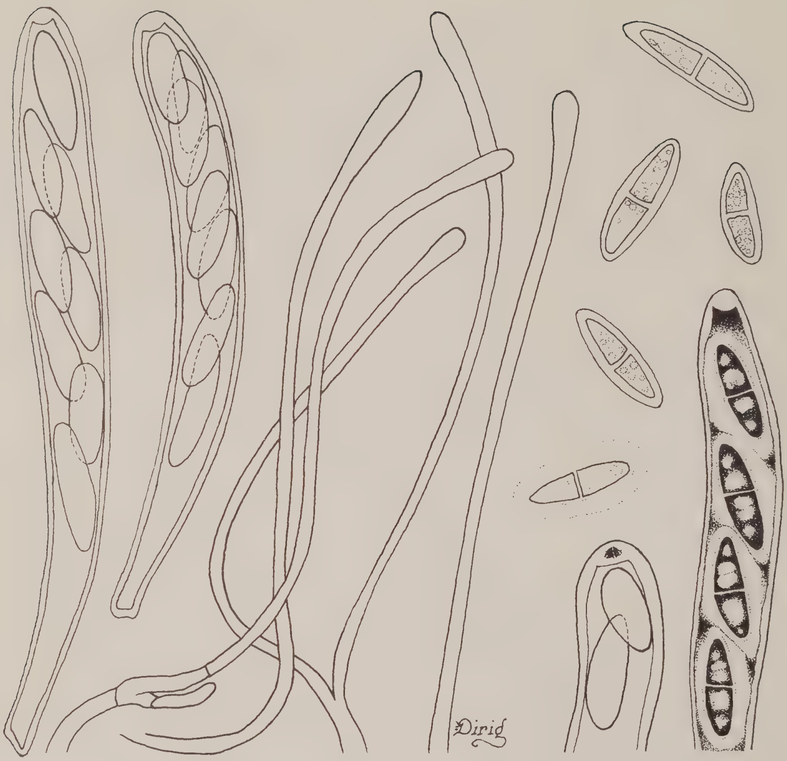
NOTES: I shall not repeat here the long list of synonyms and suspected synonyms that I provided earlier (Korf, 1952). The validating author was S. F. Gray (Nat. arr. Brit. pl. 1: 665. 1821). I have little to add to the description I gave then. The specimen for FIG. 1 is a recent collection taken in France by my colleague Françoise Candoussau and I. Mr. Dirig's drawings reproduced here are a great improvement over those I published (Korf, 1952).

2. ERIOPEZIA SAMUELSII Korf, sp. nov. FIGS. 2, 3

FIG. 1. *Eriopezia caesia*. Six asci, four with unstained pores mounted in KOH-phloxine, two with stained pores mounted in Melzer's Reagent after 10% (left) and 2% (right) KOH pretreatment; three paraphyses and four ascospores mounted in phloxine-KOH; eight marginal hairs, third from top shown in optical section; four portions of subicular hyphae, one in optical section, lowermost showing the occasional hooked

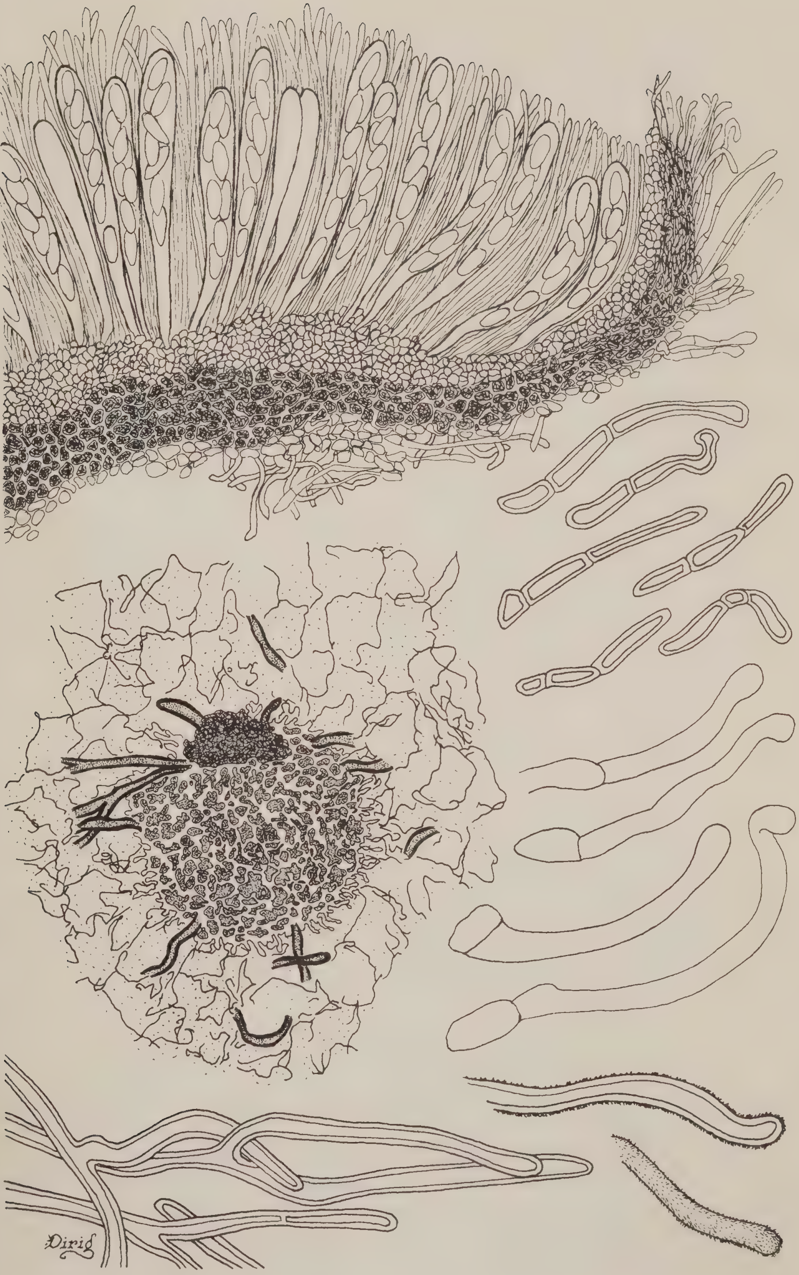


warts, all mounted in lactic acid-cotton blue; apothecial cross section mounted in Melzer's Reagent. All from CUP 58106, apothecial section × 500, all other structures × 1000, drawn with the aid of a drawing tube.



↑ FIG. 2. *Eriopezia samuelsii.* Two asci mounted in lactic acid-cotton blue; four paraphyses in Melzer's Reagent; five free ascospores, lowermost showing gel sheath, in cotton blue; ascus apex showing J+ pore after 2% KOH pretreatment, in Melzer's Reagent; ascus apex in cotton blue showing gel sheaths around spores. All CUP 57031 (HOLOTYPE), × 1000, drawn with the aid of a drawing tube.

→ FIG. 3. *Eriopezia samuelsii.* Apothecial cross section and six marginal hairs in optical section, in lactic acid-cotton blue; four hairs from base of apothecium, mounted in KOH-phloxine; portions of subicular hyphae, at left in optical section and in cotton blue, at right in water mount in optical section and surface view showing granulation that disappears in cotton blue mounts; center left, view from below of stipe attachment point to apothecium, with brown-pigmented hyphae near the point of attachment. All CUP 57031 (HOLOTYPE), apothecial section and basal view × 500, hairs and subicular hyphae × 1000, drawn with the aid of a drawing tube.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Apothecia minuta, fusca, gregaria, breviter stipitata, in tege subiculari densa immersa, hymenio paene nigro. Cellulae excipulares ectales fuscae, parientes pilos breves, hyalinos, laeves et hyphas subiculares hyalinas, laeves vel asperulas, quae folii superficiem contingentes brunnescentes sunt. Asci 93-103 × 11.0-13.2 μm, ex uncis enati, 8-spori, poro in iodo caerulescente. Ascosporae hyalinae, 1-septatae, (13.9-) 14.6-19.0 × 4.1-4.8 μm, integumento gelatinoso <1.5 μm lato involutae. Paraphyses filiformi-clavatae, pauciseptatae, 1.5 μm latae, integumento gelatinoso involutae. Typus: CUP *57031*.

ETYMOLOGY: From the name of the collector of the holotype specimen.

ILLUSTRATIONS & EXSICCATI: None.

SPECIMENS EXAMINED: *G. J. Samuels*, on dead leaves of *Gahnia* sp., Auckland Prov., Waitemata Co., Waitakere Ranges, off Mountain Rd., Walker's Bush Track, New Zealand, 7.VIII. 1974 [CUP *57031* (HOLOTYPE), R.P.K. *4134* (ISOTYPE)]. *J. M. Dingley, G. J. Samuels & S. Haydon*, on leaves of *Gahnia* sp., Auckland Prov., Waitemata County, Waitakere Ranges, vic. Kitekite Stream, along Marguerite Track, New Zealand, 30.V. 1973 [CUP *57032* (PARATYPE); AUPD *31802*, G. J. Samuels *73-104*, R.P.K. *4153* (ISOPARATYPES)].

## PARACHNOPEZIZA Korf, gen. nov.

Apothecia alba, mollia et delicatula, stipite minuto in substratum inserto praedita, hyphis paucis subicularibus circumdata, hymenio albo vel rubescente. Excipulum ex textura angulari hyalina parietibus aspectu vitri praedita consistens. Pili hyalini, crispati vel spirales. Ascosporae 3—multi-septatae, parallele fasciculatae. Typus: *Peziza miniopsis* Ellis.

ETYMOLOGY: From a superimposition of the Greek *para-*, similar to, plus the generic name *Arachnopeziza*.

NOTES: The new genus differs from *Arachnopeziza* Fuckel in having a distinct stalk inserted into the substrate rather than sessile apothecia borne upon a loose, subicular mat. The character is deemed of sufficient biological weight to assign the genera to different tribes.

### 1. PARACHNOPEZIZA AQUILINELLA (von Höhnel) Korf, comb. nov. FIG. 4

≡ *Lasiobelonium aquilinellum* von Höhnel, Denks. Kaiserl. Akad. Wiss., Math.-Naturwiss. Cl. 83: 32. 1907.

DIAGNOSIS: Apothecia tiny, 200-350 µm fide von Höhnel, pallid to dirty white, almost invisible among the hairs on the fern pinnae, short stipitate. A scanty subiculum, noted by von Höhnel, is present at the apothecial base. The type material is so scanty that I dared mount only one additional apothecium other than those on von Höhnel's slides, which are still in good condition. The ascus apex is very pointed and thus *Arachnopeziza*-like, with a pore blue in iodine fide von Höhnel. Ascospores are nonseptate when young, eventually 3-septate, often coiled, at maturity 50-55.5 × 2.6-3.7 µm (fide von Höhnel, 52-56 × 2.0-3.5 µm), and fide von Höhnel with the ascospores yellowish and the epiplasm "braunlich weinrot" in iodine. FIG. 4 shows the salient characters.

ILLUSTRATIONS & EXSICCATI: None.

SPECIMEN EXAMINED: *R. v. Wettstein & V. Schiffner,* Auf d. Unt. d. Bl. v. *Pterid. aquilina,* Monte Jaraguá, São Paulo, Brazil, V. 1901 [FH-v.H. *5335,* (HOLOTYPE).]

### 2. PARACHNOPEZIZA MINIOPSIS (Ellis) Korf, comb. nov. FIGS. 5, 6

≡ *Peziza miniopsis* Ellis, Bull. Torrey Bot. Club 8: 66. 1881.
≡ *Erinella miniopsis* (Ellis) Sacc., Syll. Fung. 8: 510. 1889.
≡ *Dasyscyphella miniopsis* (Ellis) Kanouse, Pap. Mich. Acad. Sci. 23: 151. 1938 ('1937').
≡ *Erioscypha miniopsis* (Ellis) Kirschstein, Ann. mycol. 36: 384. 1938.
≡ *Erinellina miniopsis* (Ellis) Seaver, N. Am. Cup-fungi (Inop.), p. 291. 1951.
≡ *Lasiobelonium miniopsis* (Ellis) Dennis, Persoonia 2: 185. 1962.

DIAGNOSIS: Apothecia small, mostly 0.4-0.8 mm diam, hymenium reddish when fresh, yellow to white in dried specimens, excipulum pure white, subicular hyphae when obvious also pure white. Asci (97-) 108-127 (-153) × (9.3-) 11.2-13.1 µm, the tiny pore blue (J+) in Melzer's Reagent. Ascospores (82-) 84-99 (-105) × (1.9-) 2.8-3.7 µm, often 15-septate, frequently with added septa to as many as 19-septate. Other characters are illustrated in FIGS. 5 & 6.

ILLUSTRATIONS: None.

EXCLUDED ILLUSTRATIONS: Quimio, Nova Hedwigia 28: 525, pl. IIi. 1977 (as *Erinellina* [misidentification]).

EXSICCATI EXAMINED: Bartholomew, Fungi Columbiani *2428* (*Erinella,* on *Acer saccharinum*); Ellis, North American Fungi *563* (*Peziza,* on *Acer rubrum*); Korf & Gruff, Discomycetes Exsiccati *98 (Parachnopeziza)*; Reliquiae Farlowianae *115* (*Erinella,* on *Acer*).

NOTES: The report of this species from the Philippines (Quimio, 1977) is based on an obvious misidentification, as neither the description nor illustration of short, 3-septate ascospores have any relationship to Ellis's species. The species is not uncommon on bark, particularly of *Acer* and of *Vitis,* and perhaps also on other hosts, and is known thus far only from eastern North America. I have examined many collections in CUP, CUP-D, NY, and my personal herbarium.

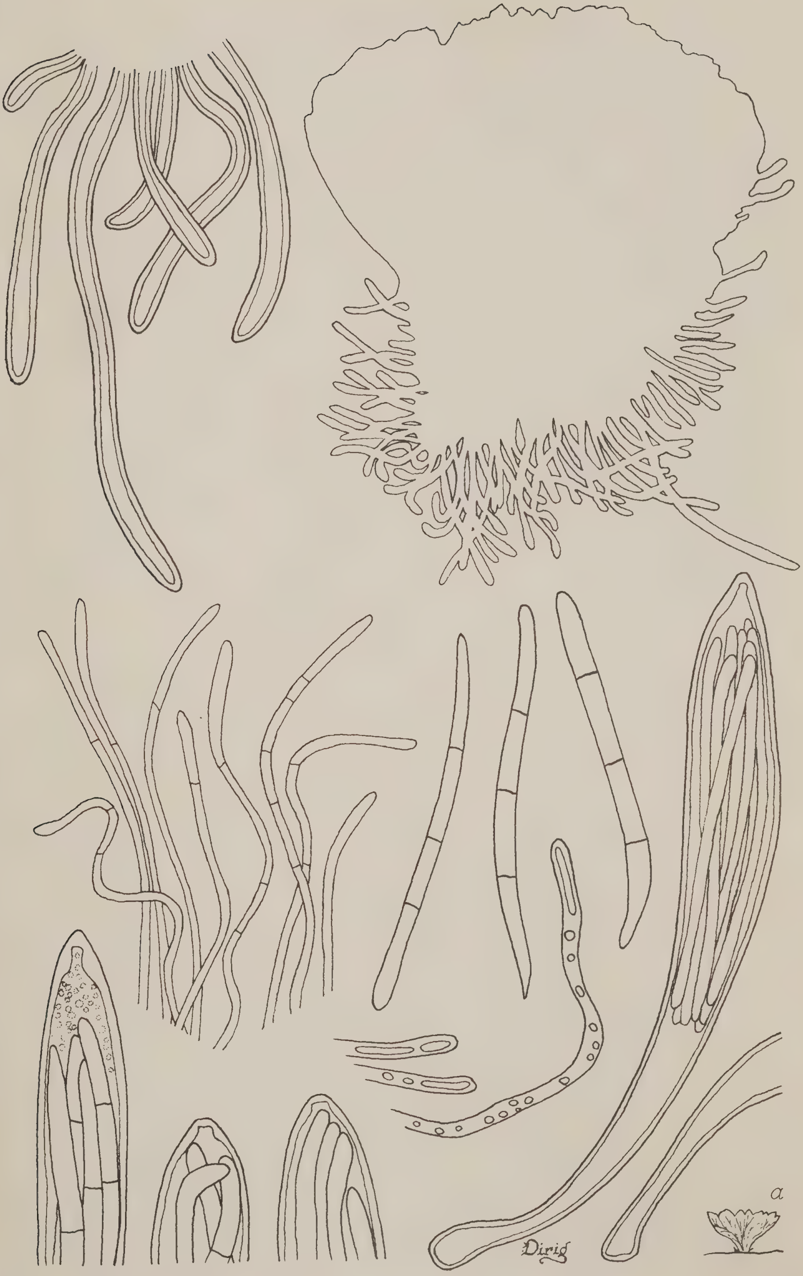
## POLYDESMIA Boudier, Bull. Soc. Mycol. France 1: 113. 1885.

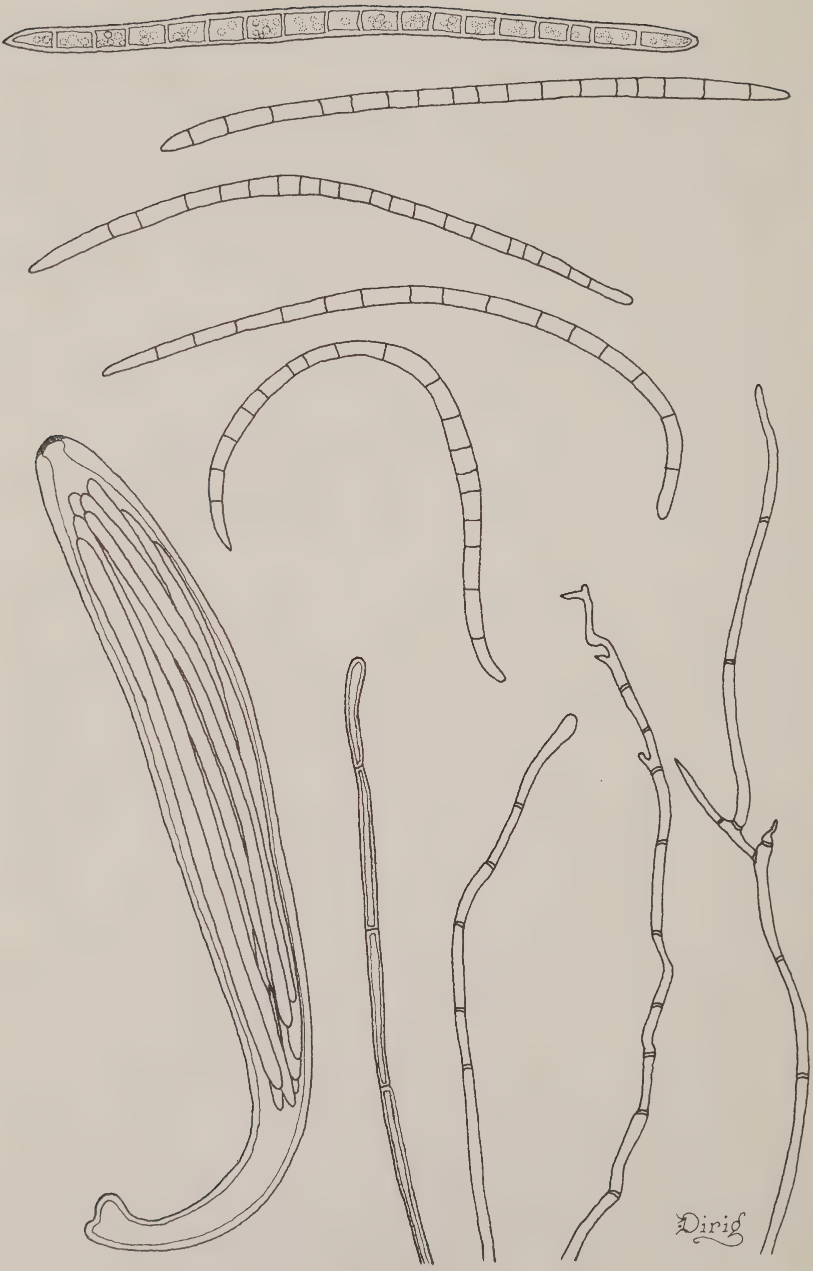
The diagnostic features of the genus are the tiny, very short-stipitate apothecia with a pruinose hymenium, pure to dirty white, often coalescent, with a glassy-walled excipulum bearing coiled or crisped, delicate hairs, with only occasional subicular hyphae noted. Ascospores are nonseptate in youth, but 1- to 3-septate at maturity, and paraphyses are propoloid, resulting in the pruinose hymenium easily visible under a hand lens when fresh or dry. The originally designated type species is *Helotium pruinosum* Jerd. *in* Berk. & Br.

### 1. POLYDESMIA DUMONTII (Korf) Korf, comb. nov. FIGS. 7, 8

≡ *Lasiobelonium dumontii* Korf, Trans. Mycol. Soc. Japan 17: 207. 1977 ('1976').

FIG. 4. *Parachnopeziza aquilinella.* Subicular hyphal ends in optical section, and outline of apothecium, mounted in water; nine paraphyses, three ascospores, three marginal hairs in optical section, three ascus apices, one ascus with ascospores, one ascus base, all in unknown mountant in permanent slide in FH-v.Höhnel collection. All FH-v.Höhnel *5335* (HOLOTYPE); apothecial outline × 500, all other structures × 1000 except *a,* a redrawing of von Höhnel's original sketch of an apothecium on his packet label, approx. × 76.


a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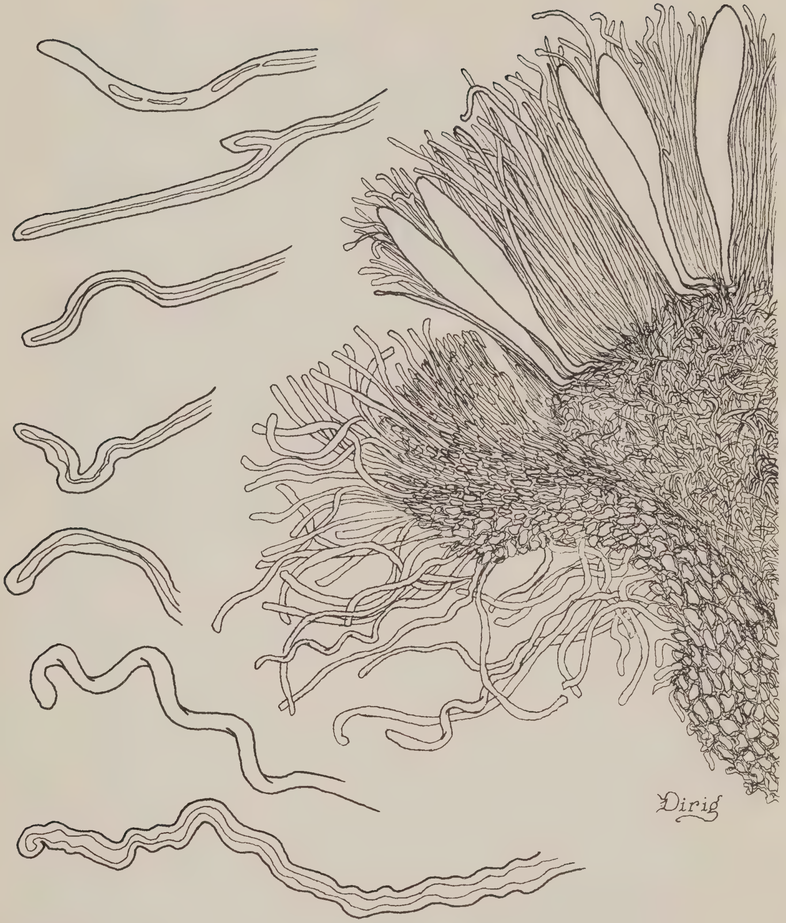


↑ FIG. 6. *Parachnopeziza miniopsis*. Seven marginal hairs, all but the next to lowest in optical section, that one in surface view showing the spiral twisting; apothecial cross section. All CUP 58107, hairs × 1000, apothecial section × 500, drawn with the aid of a drawing tube.

← FIG. 5. *Parachnopeziza miniopsis*. Five ascospores, the uppermost in optical section; ascus containing ascospores; four paraphyses, the furthest left in optical section. All CUP 58107, in Melzer's Reagent, × 1000, drawn with the aid of a drawing tube.

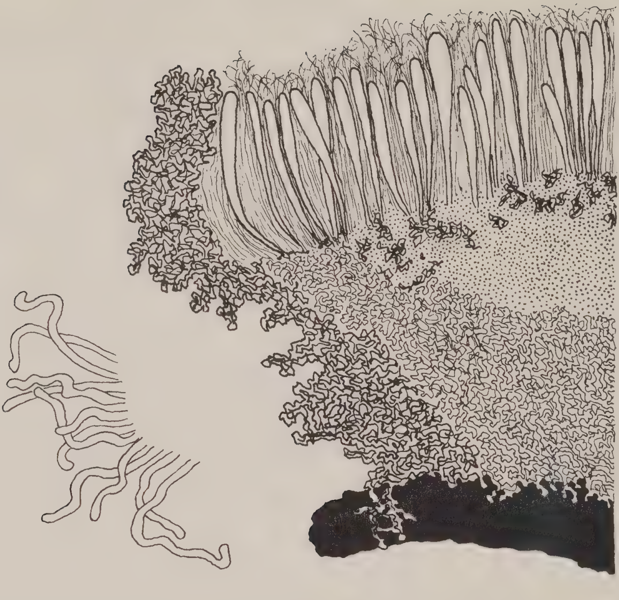


FIG. 7. *Polydesmia dumontii.* Apothecial median section (× 500) and marginal hairs (× 1000), mounted in lactic acid-cotton blue. All NY-VE 2951 (HOLOTYPE).

DIAGNOSIS: Apothecia separate, rarely confluent, sessile on a tiny stalk, <400 μm diam, excipulum pure white, woolly, hymenium pale gray when dry, pruinose (not so recorded by Korf, 1977). Hairs hyaline, coiled to crisped, 1.5 μm diam at base, <1.0 μm at apex, aseptate. Asci 4-spored, 45-56 × 7.2-8.5 μm, contents cinnamon in iodine, pore blue in iodine. Ascospores 1- to 3-septate, hyaline, subfusiform, more or less curved, 9.0-13.5 × 2.2-2.7 μm. Paraphyses hyaline, filiform, ca. 1.0 μm in diam, aseptate, apically deformed (propoloid).

ILLUSTRATIONS: Korf, Trans. Mycol. Soc. Japan 17: 207. 1977 ('1976').

EXSICCATI: None.

SPECIMEN EXAMINED: *K. P. Dumont, G. J. Samuels & L. Borjas*, on unidentified fern rachis, above fish hatchery at La Mucuy, 7 km east of Tabay, Parq. Bac. Sierra Nevada, Edo. Merida, Venezuela, 25. VII. 1971 [NY-VE *2951* (HOLOTYPE), CUP *54935* (ISOTYPE).

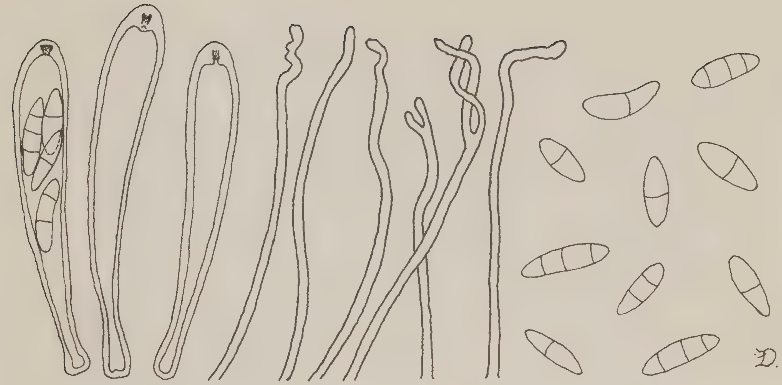


FIG. 8. *Polydesmia dumontii*. Three asci mounted in Melzer's Reagent ahowing J+ pore reaction, after pretreatment in 2% KOH; six paraphyses and ten ascospores mounted in Melzer's Reagent. All NY-VE 2951 (HOLOTYPE), × 1000.

## 2. POLYDESMIA FRUCTICOLA Korf, sp. nov. FIGS. 9-11

Apothecia minuta, alba, interdum coalescentia, stipite minuto praedita, hymenio pruinoso. Pili hyalini, crispati vel spirales. Asci (42.6-) 47.7-57.3 (-60.9) × (3.7-) 4.4-5.9 m, ex uncis enati, 8-spori (raro 4-spori), poro in iodo caerulescente. Ascosporae 1-septatae (vel raro 2—3- septatae in ascis 4-sporis), hyalinae, 5.9-11.0 (-13.2) × 1.5-2.2 μm (6.6-16.8 × 2.2-2.9 μm in ascis 4-sporis). Paraphyses propoloideae. Typus: CUP-MM *1504*.

CULTURAL CHARACTERS: Ascospores shot onto water agar germinated in less than 15 hrs at room temperature by 1 or 2 germ tubes. The fungus produces a humped, irregular, glistening colony (FIG. 11) somewhat faster growing than that of *Polydesmia pruinosa*. No conidial state has been observed by me. Transfers have been deposited with the American Type Culture Collection, Rockville, Maryland, and with the Centraalbureau voor Schimmelcultures, Baarn, of 1977 and 1978 isolations.

ILLUSTRATIONS & EXSICCATI: None.

HOLOTYPE SPECIMEN: *MADEIRA: R. P. Korf, R. Fogel, G. L. Hennebert & L. M. Kohn,* on peduncles and pods of mimosa (*Acacia* sp.), near fork in roads leading to São Roque do Faial and to Faial below Ribeiro Frio, 13. I. 1977 (CUP-MM *1504*)

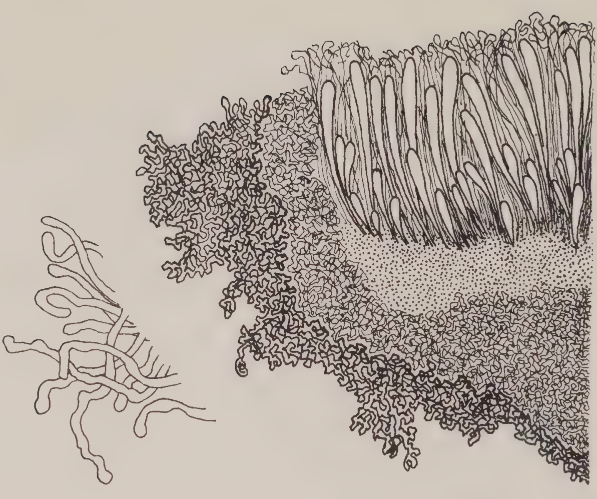


FIG. 9. *Polydesmia fructicola.* Apothecial median section (× 500) and marginal hairs (×1000), mounted in lactic acid-cotton blue. CUP-MM 1533 (PARATYPE).

(TFMC, ISOTYPE).

PARATYPE SPECIMENS EXAMINED: *CANARY ISLANDS, Tenerife: R. P. Korf, R. Fogel, G. L. Hennebert & L. M. Kohn,* on capsules of *Eucalyptus,* 4 km east of Bailadero, Punta de Anaga, 31. XII. 1976 (CUP-MM *1306*).

*MADEIRA: Same collectors,* on peduncles and pods of mimosa, 1 km above Vinháticos, toward Encumeada, 15. I. 1977 (CUP-MM *1533*). *Same collectors,* on pods of mimosa and fruits of *Eucalyptus,* 1.5 km above Monte, at km mark 5.5 toward Terreiro da Luta, 16. I. 1977 (CUP-MM *1551*). *Same data,* on wood of mimosa (CUP-MM *1556*). *Same collectors,* on fruit of *Eucalyptus,* at km mark 19.3 just outside of Santo da Serra, 19. I. 1977 (CUP-MM *1618*). *Same data,* on pods and peduncles of mimosa (CUP-MM *1619*). *R. P. Korf, L. M. Kohn, N. Korf & A. Y. Rossman,* on inner surface of bark of branchlet, 1.5 km north of Monte, 22. IV. 1978 (CUP-MM *2333*). *Same collectors,* on pods of mimosa and capsules of *Eucalyptus,* 4.1 km southeast of Portela toward Machico, 23. IV. 1978 (CUP-MM *2361*). *Same data,* on bark of *Eucalyptus* (CUP-MM *2362*). *Same collectors,* on capsule of *Eucalyptus,* public gardens ca. 6 km south of Santana, near junction with trail to Quemadas, 23. IV. 1978 (CUP-MM *2391*).

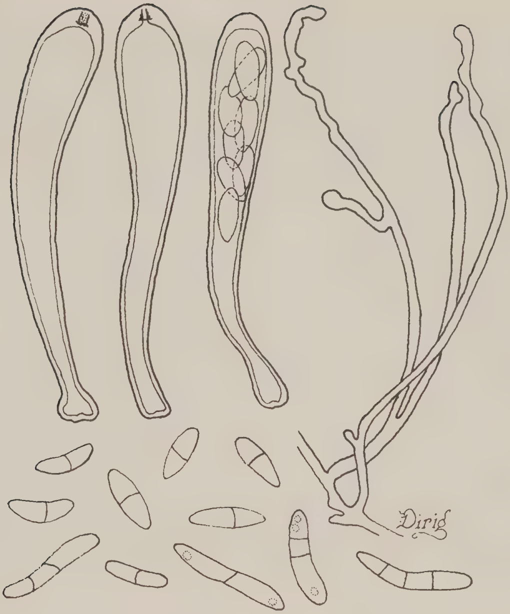


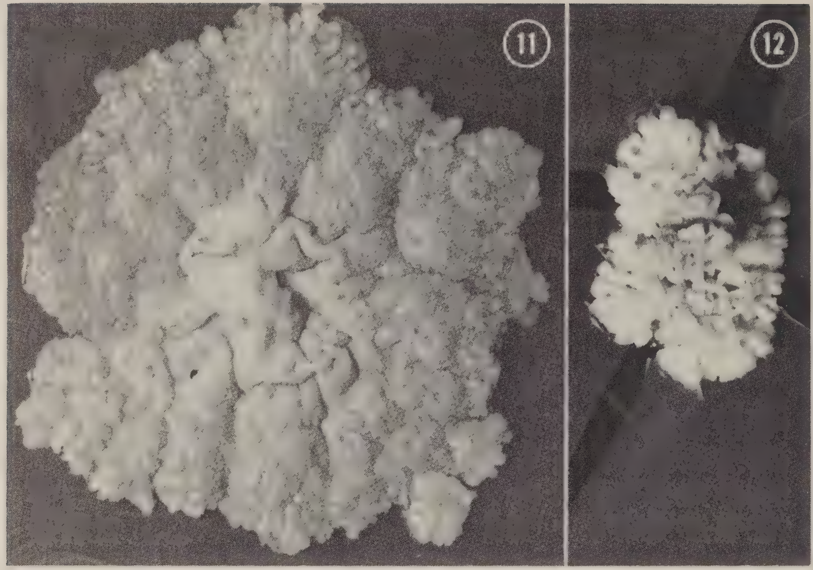
FIG. 10. *Polydesmia fructicola.* Three asci, the two at the left mounted in Melzer's Reagent showing the J+ pore reaction after pretreatment in 2% KOH, the right ascus with ascospores mounted in lactic acid-cotton blue; paraphyses mounted in Melzer's Reagent; six 1-septate ascospores from 8-spored asci and five ascospores (bottom row) showing the guttulate and multiseptate ascospores from rare 4-spored asci, all mounted in lactic acid-cotton blue. All × 1000, all CUP-MM 1504 (HOLOTYPE) except bottom row of ascospores from CUP-MM 2361 (PARATYPE).

3. POLYDESMIA PRUINOSA (Jerdon *in* Berk. & Br.) Boudier, Bull. Soc. Mycol. France 1: 113. 1885. FIGS. 12-14

≡ *Helotium pruinosum* Jerd. *in* Berk. & Br., Ann. Mag. Nat. Hist., ser. 3, 18: 127. 1866.

≡ *Pseudohelotium jerdonii* Sacc. (ut 'jerdoni'), Syll. Fung. 8: 296. 1889 [a name change, not *Ps. pruinosum* (Wallr.) Sacc. 1889].

≡ *Belonidium pruinosum* (Jerd. *in* Berk. & Br.) Rehm *in* Rabenh., Kryptogam.-Fl. Deutsch., Oesterr. Schweiz 1(3) [Lief. 35]: 510. 1891; [Lief. 36]: 562. 1891.



FIGS. 11-12. *Polydesmia* colonies grown on malt agar in petri dishes at room temperature, × 2. 11. *P. fructicola*, CUP-MM *1504*, isolated from the HOLOTYPE. 12. *P. pruinosa*, CUP-MM *1627*.

≡ *Belonium pruinosum* (Jerd. *in* Berk. & Br.) Höhn. *in* Rehm, Ann. mycol. 10: 536. 1912.

DIAGNOSIS: Apothecia tiny, rarely exceeding 500 μm, often confluent, white to dirty white, with a short stipe or nearly sessile, hymenium distinctly pruinose and exciple downy under a hand lens. Asci (78-) 80-110 × (8.0-) 8.8-10.2 (-11.0) μm, with the pore blue in Melzer's Reagent. Ascospores nonseptate at first, soon 3-septate, often slightly curved, shorter at the ascus apex, longer toward the base of the ascus, (13.9-) 14.6-20.5 (-22.0) × 3.7-5.1 μm. Paraphyses filiform but apically deformed and propoloid.

CULTURAL CHARACTERS: Brefeld (1891) reported a conidial state with fusoid to bent, 3- to 6-septate conidia borne successively on what today would be termed phialides. He noted the resemblance of the conidial state to that of *Nectria episphaeria* and its relatives that grow together with *Polydesmia pruinosa* on the same substrate. Ascospores shot onto water agar germinated by 2 polar germ tubes in less than 15 hrs at room temperature in a Macaronesian collection. The colony is slow-growing, grossly humped and irregular (FIG. 12), but I have not seen any conidia of the sort illustrated by and discussed by Brefeld, and the cultural characters he reported are at great variance with my observations. A transfer of my Macaronesian isolate has been deposited with the American Type Culture Collection, Rockville, Maryland, and with the Centraalbureau voor Schimmelcultures, Baarn.

ILLUSTRATIONS: Berkeley & Broome, Ann. Mag. Nat. Hist., ser. 3, 18: pl. 5, f. 3 (spores). Boudier, Icones Mycol. 3 [livr. 23]: pl. 453, 1909. Brefeld, Unters. Gesammtgeb. Mykol. 10: pl. 12, f. 23-24, 1891. Dennis, Brit. Cup-fungi, fig. 9D, 1960. Dennis, Brit. Ascom., fig. 9D, 1968. Lindau, Engler & Prantl, Nat. Pflanzenfam. 1(1) [Lief. 130]: 214, f. 167 A-C, 1896. Rehm, Rabenh. Kryptogamen-Fl. 1(3) [Lief. 35]: 510, fig. 1-5 (supra), 1891.

EXSICCATI EXAMINED: Cooke, Fung. brit. exs. *575* (*Helotium*); Cooke, Fung. brit. exs. ed. 2, *390* (*Helotium*); Jaap, Fungi sel. exs. *309* (*Belonidium*, on *Diatrype stigma*); Jaap, Fungi sel. exs. *309b* (*Belonidium*, on *Diatrypella favacea*); Krieger, Fungi sax. *1034* (*Belonidium*, on *Melogramma spiniferum*); Krieger, Fungi sax. *2277* (*Belonidium*, on *Cryptosphaeria eunomia*); Phillips, Elvell. brit. *89* (*Helotium*); Rabenhorst, Fungi eur. *1514* (*Helotium*); Rehm, Ascom. *2004* (*Belonium*, on *Diatrype stigma*); Roumeguere, Fungi gall. exs. *2771* (*Helotium*, on *Diatrype* spp.); de Thümen, Mycoth. univers. *1210* (*Helotium*).

EXCLUDED EXSICCATI: Kryptogamae Exsiccatae *723*, issued as *Belonidium pruinosum* on *Diatrype stigma*, in all copies examined by me is instead a *Bisporella*, presumably *B. discedens* (Karst.) Carp., with a *Cystodendron* anamorph like that reported by Carpenter (1975).

CRITICAL SPECIMENS EXAMINED: This fungus is common and widespread in Britain and in continental Europe on many different pyrenomycetes. It appears to be previously unreported from North America, where my survey of herbaria has revealed only 11 North American collections deposited in CUP and NY (and none at BPI, FH, MICH or UC under any of the synonyms). According to Dr. John H. Haines of the New York State Museum *(pers. comm.)*, it may be common but rarely collected in the Pacific Northwest; he has sent me several collections from his personal herbarium from Washington, New York, and Tennesee. I report all these here, along with 6 Macaronesian collections also representing an extension of the known range.

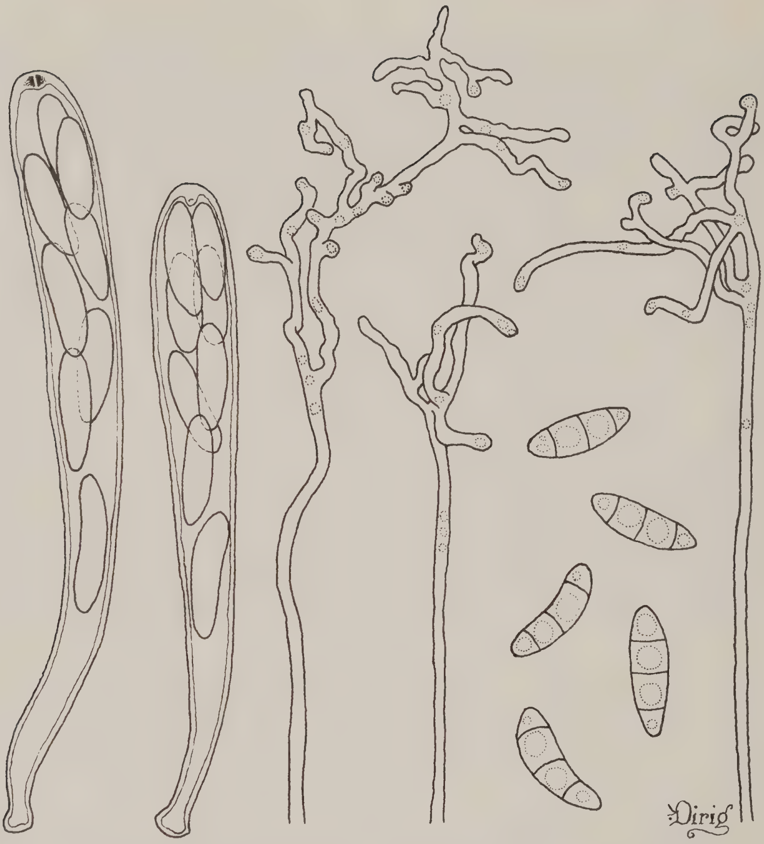


FIG. 13. *Polydesmia pruinosa*. Two asci with ascospores, the left mounted in Melzer's Reagent showing the J+ ascus pore after pretreatment with 2% KOH, the right mounted in KOH-phloxine-glycerine; paraphyses mounted in Melzer's Reagent; five free ascospores mounted in lactic acid-cotton blue. All × 1000, CUP-MM 1481.

I have never collected the species in Japan or in South East Asia, and no reports are known from the southern hemisphere. It is a cool climate or montane species. Many authors have failed to see the septa in ascospores, though these are evident in KOH-phloxine-glycerine or lactic acid-cotton blue mounts. The new extensions of reported range are:

NORTH AMERICA: *CANADA, British Columbia: R. J. Bandoni*, on old pyrenomycete on fallen *Acer macrophyllum*, 20. II.

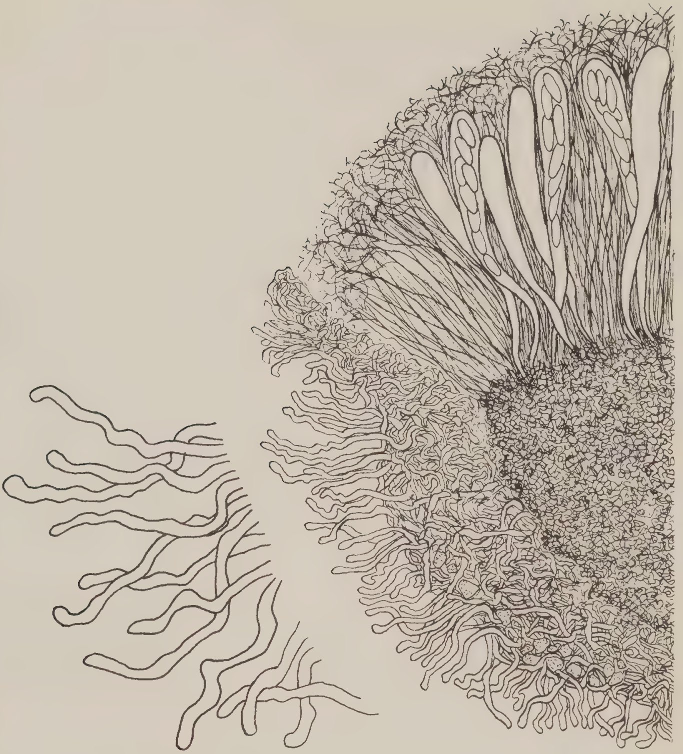


FIG. 14. *Polydesmia pruinosa*. Apothecial median section (× 500) and marginal hairs (× 1000), mounted in lactic acid-cotton blue. CUP-MM 1481.

1962, BC-*2316* (NY).

*UNITED STATES, New York: R. P. Korf 3066,* on a pyrenomycete, Stoddard Brook, Allegany State Park, 11. VI. 1961 (CUP *57033*). *C. T. Rogerson & S. J. Smith,* on stromata of *Hypoxylon* sp., Essex County, woods near Heart Lake, 2. IX. 1965 (NY). *Same collectors,* on stromata of *Hypoxylon,* Essex County, 2 miles northeast of Heart Lake, 3. IX. 1965 (NY). *C. T. Rogerson, S. J. Smith & D. Moore,* on stromata of *Hypoxylon* on *Salix,* St. Lawrence County, near Wanakena Forest School, 18. IX. 1969 (NY). *J. H. Haines 1441 & S. J. Smith,* on old stroma, Cascade Lakes, near Upper Jay, Essex County, 23. VII. 1970 (J.H.H.). *J. H. Haines 1600 & C. Marr,* Otsego County, NYSU Oneonta field station near Cooperstown, 28. IX.

1970 (NY; J.H.H.). *C. T. Rogerson, S. J. Smith & R. Fogel,* on stromata of *Diatrype stigma* and dead branches, Ulster County, trail from Winnisook Lake, west side of Slide Mountain, Catskill Mountains, 1. VIII. 1974 (NY). *L. M. Kohn & R. P. Korf,* on *Diatrype* and on *Hypoxylon,* Huntington Memorial Camp, Raquette Lake, 11. IX. 1976 (CUP *54956*). *C. T. Rogerson,* on *Apiosporina morbosa* on *Prunus* sp., near Berlin Mts. Club, Rensselaer County, 10. IX. 1977 (CUP *56994*).

*Pennsylvania: M. Sherwood 2128,* on *Hypoxylon* on *Fagus,* Tionesta tract, Allegheny National Forest, Forest County, 18. X. 1975 (CUP *54878*).

*Tennessee: C. T. Rogerson,* on *Diatrype stigma,* Sevier County, along Cole Branch, Little Pigeon River, Great Smoky Mts. National Park, 18. X. 1960 (NY; J.H.H. *1700*). *J. H. Haines 1724,* on old stroma of *Hypoxylon* sp., Cades Cove, Great Smoky Mts. National Park, 11. VIII. 1968 (J.H.H.).

*Washington: J. H. Haines 38,* on stroma of pyrenomycete, Redmond, King County, east of Lake Washington in wooded area, 6. III. 1964 (J.H.H.). *J. H. Haines 52,* on remains of pyrenomycete stroma, Lee Experimental Forest, Snohomish County, 26. IV. 1964 (J.H.H.). *J. H. Haines 238, same data,* 16. IV. 1966 (J.H.H.).

MACARONESIA: *CANARY ISLANDS, La Palma: R. P. Korf, W. C. Denison, L. M. Kohn & M. A. Sherwood,* on old xylariaceous stroma, Los Tilos, 14. I. 1976 (CUP-MM *639;* TFMC). *Same collectors,* on pyrenomycete, Forest road south of Los Tilos, 14. I. 1976 (CUP-MM *709*).

*MADEIRA: R. P. Korf, R. Fogel, G. L. Hennebert & L. M. Kohn,* on an immersed pyrenomycete on wood, mixed forest at Ribeiro Frio, 13. I. 1977 (CUP-MM *1481;* TFMC). *Same collectors,* on pyrenomycete on wood, waterfall along road to Fajã da Nogueira, 2.5 km from junction with main road, 19. I. 1977 (CUP-MM *1627*). *R. P. Korf, L. M. Kohn, N. Korf & A. Y. Rossman,* on pyrenomycete, at waterfall 2.3 km toward Fajã da Nogueira from main road, 21. IV. 1978 (CUP-MM *2277*). *Same collectors,* on pyrenomycetes, path to Balcões from Ribeiro Frio, 22. IV. 1978 (CUP-MM *2345*).

## *EXCLUDED SPECIES OF ERIOPEZIA AND POLYDESMIA*

No attempt is made here to repeat the listing of species considered doubtful or excluded from *Eriopezia* in my earlier monograph (Korf, 1952), to which the reader is referred.

1. ERIOPEZIA MICROSPORA (Kanouse) Dennis, Kew Bull. 17: 323. 1963. FIG. 15

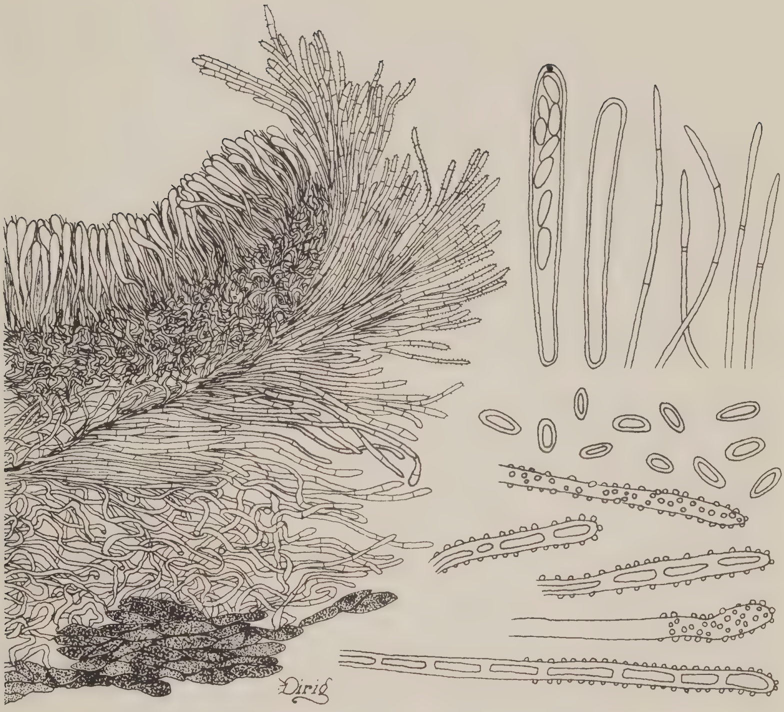


FIG. 15. *Lachnellula* sp. *(= Eriopezia microspora).* Two asci mounted in Melzer's Reagent, the one at the left pretreated in 10% KOH showing J+ ascus pore; five paraphyses mounted in lactic acid-cotton blue; eleven ascospores mounted in Melzer's Reagent; five marginal hairs mounted in lactic acid-cotton blue or in KOH-phloxine-glycerine, two in surface view and three in optical section; apothecial median section, with host tissues (dark) at base. Apothecial section (× 500) and bottom hair (× 1000) from HOLOTYPE of *E. microspora;* all other structures × 1000, from PARATYPE of *E. microspora.*

≡ *Lachnella tricolor* (Sow. ex Pers. : Fr.) Phill. var. *microspora* Kanouse, Pap. Mich. Acad. Sci. 20: 73. 1935 ('1934').
≡ *Lachnella microspora* (Kanouse) Seaver, N. Am. Cup-fungi (Inop.) p. 267. 1951.
?=[*Peziza alboviridis* Cooke, Grevillea 7: 47. [xii] 1878, non *P. alboviridis* Sauter, Mitt. Ges. Salzburger Landesk.

18: 108. [earlier than 6. vii] 1878] (later homonym)
≡ *Trichopeziza alboviridis* Sacc., Syll. Fung. 8: 415. 1889 (ut '(Cooke) Sacc.') (new name, ICBN Art. 72, Note).

SPECIMENS EXAMINED: *Michigan: A. H. Smith 33-151,* on oak, Cascade Glen, near Ann Arbor, Washtenaw Co., 10 May 1933, MICH (HOLOTYPE of *Lachnella tricolor* var. *microspora;* CUP *57036,* ISOTYPE). *A. H. Smith 33-36,* George Reserve, Pinckney, 13 May 1933, MICH (PARATYPE of *Lachnella tricolor* var. *microspora;* CUP *57037,* ISOPARATYPE).

*Georgia: H. W. Ravenel 2447,* on decorticated *"Myrica"* or in fissures of the bark, Darien, K (HOLOTYPE of *Peziza alboviridis* Cooke and hence of *Trichopeziza alboviridis* Sacc.).

NOTES: The fragment of the type specimen of *Peziza alboviridis* Cooke received from Kew on loan bore only a few apothecia of a lichen, and I am unable to confirm Dennis's suggested synonymy on the basis of that material. Kanouse's fungus is surely not an *Eriopezia,* for it has strongly gelatinized hyphae in the outer ectal excipulum, and is very closely related to *Lachnellula pulveracea* (Alb. & Schw. *ex* Fr.) Dennis, though Dennis (1963) apparently failed to see the similarity. In view of the uncertainty concerning Cooke's (actually, Saccardo's!) epithet, and the inability to transfer Kanouse's varietal epithet because of the earlier *Lachnellula microspora* Ell. & Everh., I do not propose a name for it in *Lachnellula.* Possibly both *L. pulveracea* and this species deserve some genus of their own rather than being accommodated in the very broad concept of *Lachnellula* that both Dennis and I have adopted.

2. ERIOPEZIA ROSEOLO-TINCTA Svrček, Česká Myk. 12: 226. 1958.

= *Nectria carnea* Desmazières, Pl. crypt. France, sér. 2, fasc. 8, *373.* 1856; Bull. Soc. Bot. France 4: 998. 1857.
  ≡ [*Sphaerella carnea* Roberge, in herb.]
  ≡ *Nectriella carnea* (Desm.) Sacc., Michelia 1: 278. 1878.

NOTES: The ascocarps, immersed in a subiculum, are not apothecia, but Hypocreaceous perithecia. I was struck by the similarity with the description of *Nectriella carnea* in Saccardo (1883), and consulted Dr. C. T. Rogerson, New York Botanical Garden, as to whether this was indeed that species, recorded by Saccardo on *Luzula,* the host of Svrček's species.

Rogerson has graciously followed up the question, and has obtained the type specimen of *Nectria carnea* from Paris and has resolved the identity and also the question of whether the species should be assigned to *Pseudonectria* (the correct generic name for *Nectriella* in Saccardo's sense). He has permitted me to record his observations here. Though there are slight differences between Svrček's specimen on *Luzula* and Desmazières's specimen on *Carex*, Rogerson concludes they are synonyms. On both the label description and the journal description of *Nectria carnea* two hosts were given: *Carex* and *Buxus*. Rogerson notes that Tulasne & Tulasne (1865) studied Desmazières's material, treating that on *Carex* as *N. carnea* and that on *Buxus* as *N. rousseliana* ('russeliana'), thus effectively lectotypifying *N. carnea* with the *Carex* fungus. He formally designates here as LECTOTYPE of the name *N. carnea* Desm. the specimen on dead leaves of *Carex*, *"Roberge* in Desmazières, Pl. crypt. France ser. 2, fasc. 8, *373"* on deposit in PC. Rogerson notes that "Septation in ascospores is not absolutely clear. In one perithecium of *Eriopezia* [*roseolotincta*] that I mounted there appears to be a definite, median septum in some of the spores (mounted in heated acid fuchsin-lactic acid). The same is true in the Desmazières' material but here the ascospores are so tightly clumped that it is difficult to make a decision." Further, he notes that that *Nectria*, rather than *Pseudonectria* (= *Nectriella* Sacc.), is the appropriate genus in which to range these specimens.

SPECIMEN EXAMINED BY KORF AND ROGERSON: *J. Kubička & M. Svrček*, Slovakia septentr., montes Belanské Tatry, in convalle "Holubyho dolina" (="Dolina Siedmich prameňov") supra Tatranská Kotlina. *Luzula albida (= nemorosa)*. 3.8.1956. CUP *57039* (ISOTYPE of *Eriopezia roseolo-tincta* Svr.).

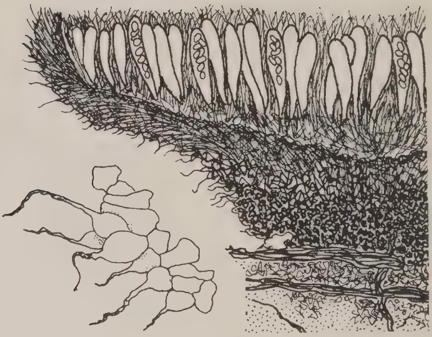
SPECIMEN EXAMINED BY ROGERSON: *Nectria carnea* Desmaz. Pl. Crypt. Ser. novis, fasc. VIII (1856), n. *373*, in fol. *Caricum* siccus, PC (LECTOTYPE).

### 3. POLYDESMIA HERBICOLA Svrček, Česká Myk. 21: 149. 1967.

FIGS. 16, 17

NOTES: This species cannot be accommodated in *Polydesmia*, but certainly is a member of the Hyaloscyphaceae. Our drawings (FIGS. 16, 17) are not in good agreement with those published by Svrček (1976: 148), who apparently did not see the strongly swollen bases of the hairs. It seems best accommodated in *Hyaloscypha*, and I formally propose its transfer there as **Hyaloscypha herbicola** (Svrček) Korf, *comb. nov.* The dark-walled excipular cells are unusual in *Hyaloscypha*,

FIG. 16. *Hyaloscypha herbicola*. Apothecial median section mounted in lactic acid-cotton blue (× 500) and marginal hairs mounted in KOH-phloxine-glycerine (× 1000). All PRM 666708 (HOLOTYPE).



but I am not convinced how highly that character should be weighted. Recently Svrček has removed *Hyaloscypha dematiicola* (Berk. & Br.) Nannf. from the genus on the basis of its brown-walled excipular cells, as the type species of a new genus, *Dematioscypha* Svr., which he still retains in the Hyaloscyphaceae. *Hyaloscypha herbicola* does not seem very close to *H. dematiicola*, nor to Svrček's other new genus, *Ciliolarina*, erected in the same paper for a species placed in an uncertain position (Dermataceae? Hyaloscyphaceae?), also with brown-walled excipular cells and hairs.

SPECIMEN EXAMINED: *M. Svrček 630*, Slovakia, montes Belanské Tatry: in valle "Dolina Sedmi pramenů" supra Tatranská Kotlina. Ad caulem iac. *Senecionis nemorensi*. 26. VII. 1958. PRM *666708* (HOLOTYPE).

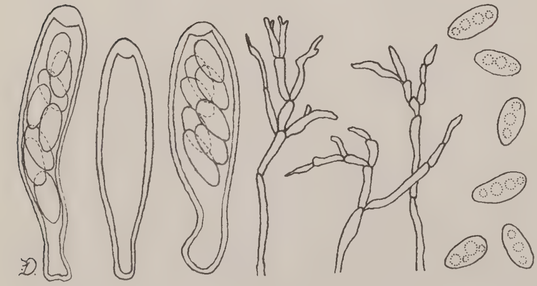


FIG. 17. *Hyaloscypha herbicola*. Three asci, two with ascospores, mounted in Melzer's Reagent; three paraphyses; six ascospores mounted in Melzer's Reagent. All × 1000, PRM 666708 (HOLOTYPE).

4. POLYDESMIA ROSAE Killermann, Krypt. Forsch. 2(3): 271. 1935.
FIGS. 18, 19

NOTES: This is unquestionably a species of *Propolomyces* Sherw. [= *Propolis* (Fr.) Fr. non *Propolis* (Fr.) Corda] with immersed apothecia. The pruinose hymenium is doubtless what

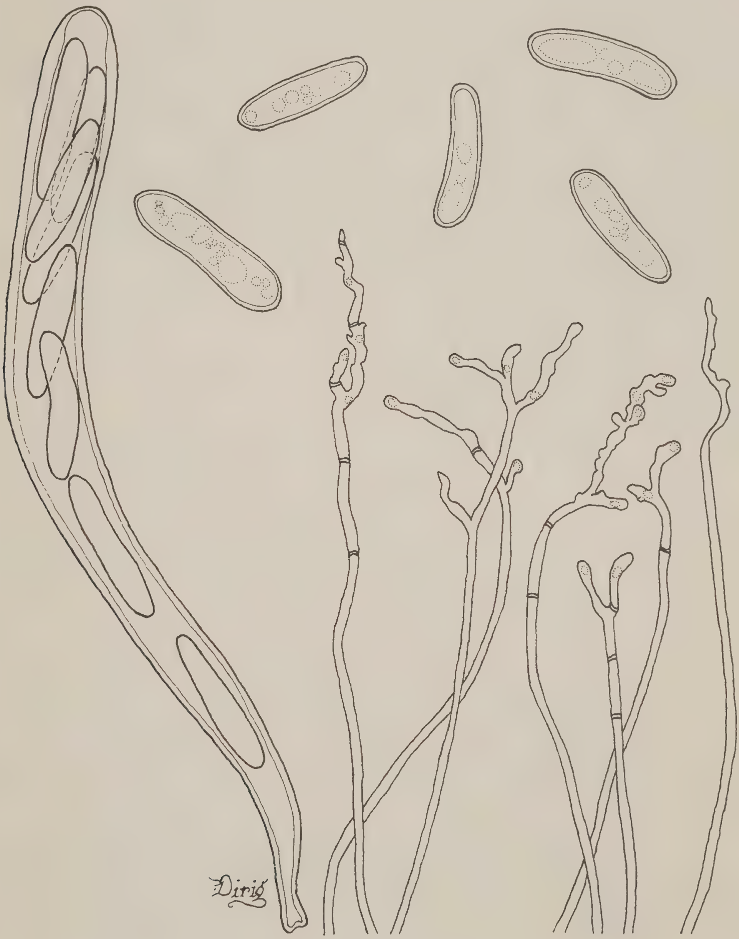


FIG. 18. *Propolomyces* sp. *(= Polydesmia rosae)*. Ascus containing ascospores, five loose ascospores, paraphysis apices, all × 1000, mounted in Melzer's Reagent. Drawn from the HOLOTYPE with the aid of a drawing tube.

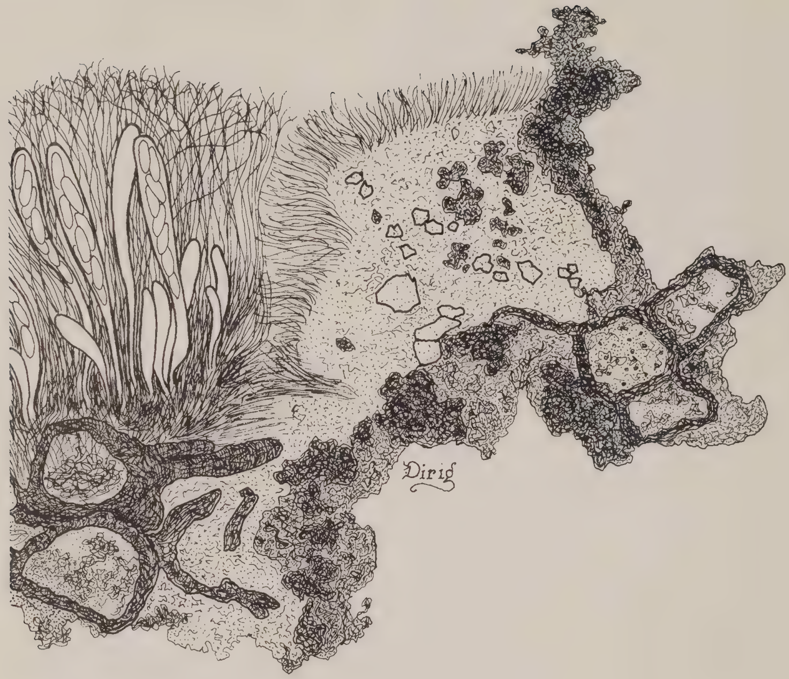


FIG. 19. *Propolomyces* sp. *(= Polydesmia rosae)*. Median section of an apothecium mounted in lactic acid-cotton blue, × 500. Drawn from the HOLOTYPE.

led Killermann to describe this in *Polydesmia*. I consulted Dr. Martha Sherwood, Farlow Herbarium, Harvard University, on the species, and accept her opinion that it may represent a specimen of *Propolomyces farinosus* (Pers.) Sherw. [= *Propolis versicolor* (Fr.) Fr.], though the spores seem a bit too narrow.

SPECIMEN EXAMINED BY KORF AND SHERWOOD: *S. Killermann*, [in pith of *Rosa canina*], Kryptog. Forschunger II, S 21 *Typus!*, Regensburg: Jrlbach, 10. V. 1934, M (HOLOTYPE), CUP 56048 (ISOTYPE).

## *APPENDIX*

## *PEZICULA LINDA SP. NOV.,*
## *A POLYDESMIA LOOK-ALIKE*

One of our Macaronesian collections, on chips of wood, was at first taken for a species of *Polydesmia*, since it is nearly white, has a pruinose hymenium and scattered apothecia. Unlike species of *Polydesmia*, however, it is devoid of hairs and has very large asci, the pore of which is insensitive to Melzer's Reagent when apothecia are rehydrated in water, but with a strongly J+ pore mechanism when rehydrated in 2% KOH, as is now known to be typical of *Pezicula*, *Dermea*, and some other genera (Kohn & Korf, 1975). Most species of *Pezicula* are erumpent from bark in caespitose groups, unlike those of this Macaronesian collection. The apothecia of this apparently undescribed species, much larger than those of any species of *Polydesmia*, have a pruinose hymenium and propoloid paraphyses, characters already known in some other species of *Pezicula*.

PEZICULA **LINDA** Korf, sp. nov. FIGS. 20-22

Apothecia <500 µm diam, pallida, sessilia vel breviter stipitata, sparsa sed raro coalescentia, hymenio pruinoso. Excipulum ex cellulis globosis pallide brunneis consistens. Asci 8-spori, (85-) 95-102 (-117) × (15.4-) 16.8-19.8 µm, ex uncis enati, poro in iodo non nisi post tractatione priore cum KOH caerulescente. Ascosporae non septatae, hyalinae, ellipsoideae, (17.6-) 20.5-26.4 × 7.3-9.5 (-11.0) µm. Paraphyses anastomosantes, propoloideae. Typus: CUP-MM *264*.

ETYMOLOGY: From the Latin, *linda* = beautiful.

ILLUSTRATIONS & EXSICCATI: None.

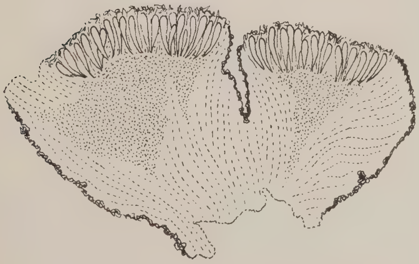


FIG. 20. *Pezicula linda*. Two apothecia in median section, × 50. CUP-MM 264 (HOLOTYPE).

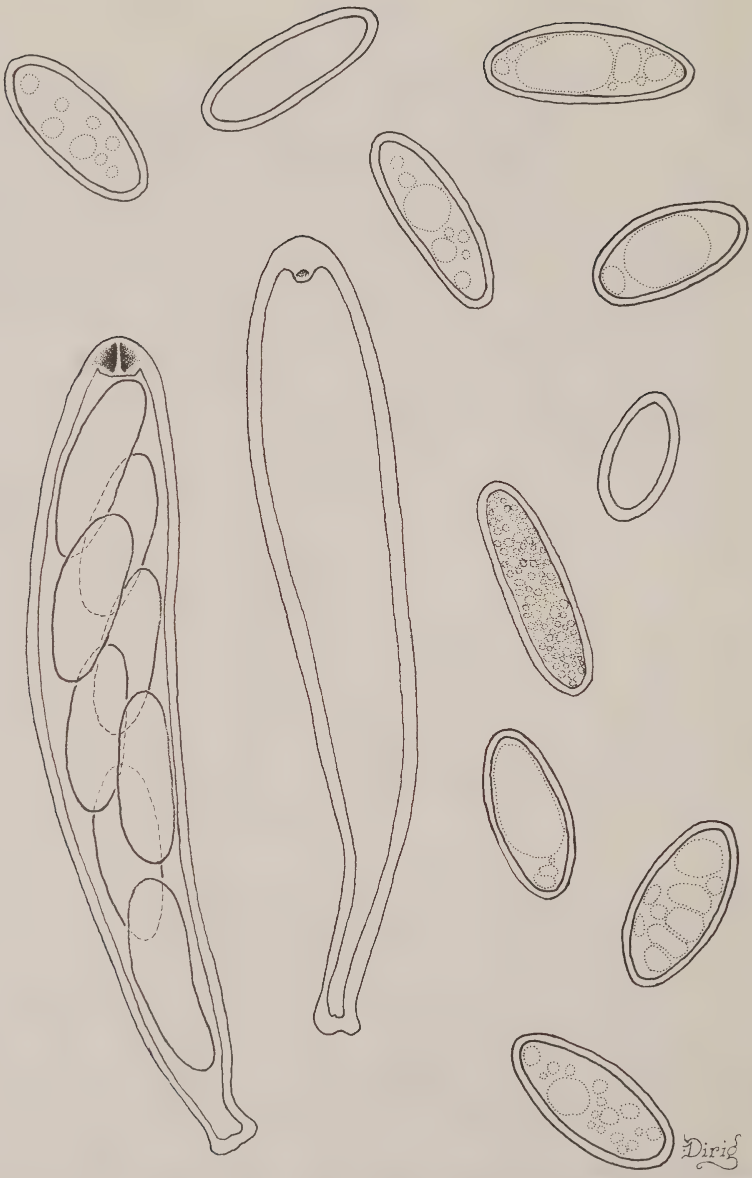


FIG. 21. *Pezicula linda*. Two asci mounted in Melzer's Reagent after 2% KOH pretreatment showing bluing of the apical mechanism; ten free ascospores in Melzer's Reagent. All × 1000, CUP-MM 264 (HOLOTYPE), drawn with the aid of a drawing tube.

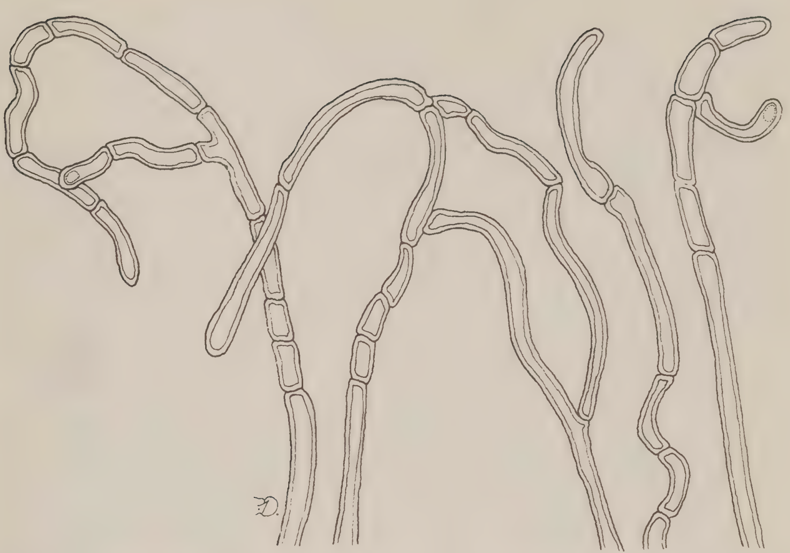


FIG. 22. *Pezicula linda*. Paraphyses mounted in Melzer's Reagent, × 1000. CUP-MM 264 (HOLOTYPE).

SPECIMEN EXAMINED: MACARONESIA: *CANARY ISLANDS, Tenerife: R. P. Korf, W. C. Denison, L. M. Kohn, M. A. Sherwood & E. Beltrán,* on cut wood, Fuente de las Pulgas, Las Yedras, Monte de las Mercedes, 7. I. 1976, CUP-MM *264* (HOLOTYPE), TFMC (ISOTYPE).

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# NOMENCLATURAL NOTES. XI. ACCEPTABLE GENERIC TYPIFICATIONS BY CLEMENTS & SHEAR AND NON-TYPIFICATIONS BY SACCARDO

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### *SUMMARY*

Despite claims that the generic typifications by Clements & Shear in *The Genera of Fungi* are arbitrary first-species choices and can be ignored, many of these are legitimate (and often earliest) typifications with significant nomenclatural implications. The assumption that Saccardo typified genera in *Conspectus generum Discomycetum* is challenged, and the mentions of species there are held not to be lectotypifications.

No single nomenclatural act is likely to have greater impact than lectotypification of previously untypified generic names. The act of almost irrevocably tying a generic name to one particular species (name) may thereby seriously affect the generic name that is correctly to be applied to other species, sometimes one or a few, sometimes scores or hundreds. This paper examines two of the sources commonly cited as places of first lectotypification of generic names of fungi in the hope that it will dispel some of the myths that have crept into the mycological literature.

## I. CLEMENTS & SHEAR'S *THE GENERA OF FUNGI*

Few mycologists are unaware that Clements & Shear (1931) provided not only keys to the genera of fungi and lichens, but also a list of genera, both accepted and synonymous, that indicates a type species for each generic name. Many genera were previously described as new by Clements (1909) in the first edition of *The Genera of Fungi*, but in that publication type species were designated only for the new generic names. It is the untypified or retypified generic names in the second edition of *The Genera of Fungi* (Clements & Shear, 1931) that concern us here. They appear in the "List of Types and Synonyms" on pp. 233-413, and constitute over 1/3 of the text material.

There can be no doubt that these are explicit typifications. If one of these choices is the earliest for a particular generic name, it presumably stands, for "The author who first designates a lectotype ... must be followed ... [unless] it can be shown that the choice was based upon a misinterpretation of the protologue, or was made arbitrarily" (Art. 8, International Code of Botanical Nomenclature).

Misinterpretation of the protologue is a failing that can befall any taxonomist; surely among the hundreds of generic names lectotypified by Clements & Shear some must be discarded on that basis. Each, however, is a case unto itself, and must be dealt with by a competent taxonomist/monographer.

*Arbitrarily* chosen lectotypes are to be avoided scrupulously, and if it can be shown that Clements & Shear arbitrarily designated lectotypes for the generic names they treated, their whole list of typifications can be thrown out and ignored. The major force of Art. 8's *arbitrary* provision is directed against the "first-species rule" of the "American Code of Nomenclature" that was the source of dissention for so many years amongst nomenclaturalists. Followers of the "American Code" held that when no species was designated the type of a generic name, the *first species listed was automatically* the type species of that name. The effect of Art. 8 is to allow taxonomists to ignore all such lectotypifications *when based on the first-species selection rule.*

Are the Clements & Shear generic name lectotypifications arbitrary choices, based on the first-species rule? Many mycologists ignore or simply do not mention the Clements & Shear typifications. At least one eminent mycologist recently voiced what may be a common view: in discussing the generic name *Cercosporella* Saccardo (1880), erected with two syntypic species, Deighton (1973: 3) stated:

> "Clements & Shear (1931: 391) cited *C. persica* as the type (i.e. the lectotype) and this has been repeated subsequently by several authors; but Clements & Shear did no more than follow the custom of taking the first-cited species as type without any further consideration."

Deighton, and presumably all others who chose to disregard the Clements & Shear lectotypifications (by discarding them under Art. 8), apparently have overlooked the five paragraphs headed "Generic Types" on pp. 14-15 of the Clements & Shear volume. The International Code of Botanical Nomenclature is discussed there at length, as is the necessity to select appropriate type species for generic names, and the necessity to avoid arbitrary systems of selection! In no manner of thinking can these designations be considered "first-cited species as type" examples.

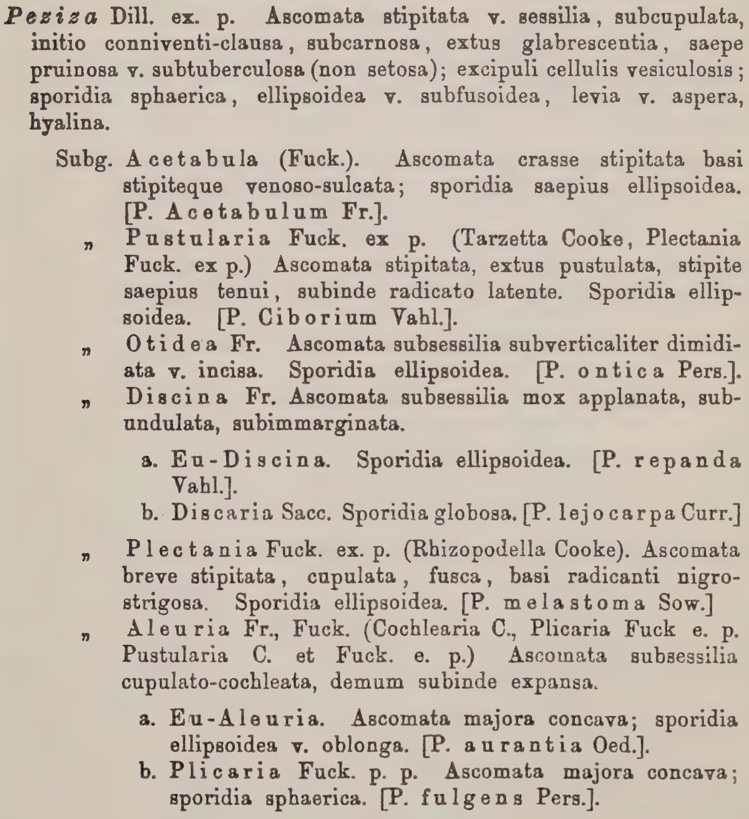
Mycologists must, however, be cautious in accepting the Clements & Shear typifications. Many simply are not the *first* such designation, as required by Art. 8. In other cases, to obtain stability, Clements & Shear (1931: 15) went well *beyond* what is now permitted under the ICBN:

> "Since the application of a generic name depends upon the type species and many genera contain species that are not congeneric, it is desirable to select a type that will cause the least change. This is many cases necessitates the choice of a species not included by the original author of the genus."

An example of such an unacceptable typification is the indication of "*Belonium pineti* (Batsch) Rehm" as the type of *Belonium* Saccardo (1884); that generic name when erected had but two mentioned species, the only ones eligible as lectotype, neither being *B. pineti*.

## II. SACCARDO'S *CONSPECTUS GENERUM DISCOMYCETUM*

An important treatment of Discomycetes by Saccardo (1884) was his *Conspectus generum Discomycetum hucusque cognitorum*, which set the stage for the sporological system of classification of Discomycetes adopted in the *Sylloge Fungorum* (Saccardo, 1889). The 1884 paper provided a hierarchal system of families, genera, subgenera, and infrasubgeneric taxa of unspecified rank (sections?). Most of these infrageneric taxa became generic names in the *Sylloge*. A significant feature of the paper is the listing of species names following each of the genera or infrageneric taxa. FIG. 1 reproduces a portion of this treatment.



***Peziza*** Dill. ex. p. Ascomata stipitata v. sessilia, subcupulata, initio conniventi-clausa, subcarnosa, extus glabrescentia, saepe pruinosa v. subtuberculosa (non setosa); excipuli cellulis vesiculosis; sporidia sphaerica, ellipsoidea v. subfusoidea, levia v. aspera, hyalina.

Subg. Acetabula (Fuck.). Ascomata crasse stipitata basi stipiteque venoso-sulcata; sporidia saepius ellipsoidea. [P. Acetabulum Fr.].

„ Pustularia Fuck. ex p. (Tarzetta Cooke, Plectania Fuck. ex p.) Ascomata stipitata, extus pustulata, stipite saepius tenui, subinde radicato latente. Sporidia ellipsoidea. [P. Ciborium Vahl.].

„ Otidea Fr. Ascomata subsessilia subverticaliter dimidiata v. incisa. Sporidia ellipsoidea. [P. ontica Pers.].

„ Discina Fr. Ascomata subsessilia mox applanata, subundulata, subimmarginata.

a. Eu-Discina. Sporidia ellipsoidea. [P. repanda Vahl.].
b. Discaria Sacc. Sporidia globosa. [P. lejocarpa Curr.]

„ Plectania Fuck. ex. p. (Rhizopodella Cooke). Ascomata breve stipitata, cupulata, fusca, basi radicanti nigrostrigosa. Sporidia ellipsoidea. [P. melastoma Sow.]

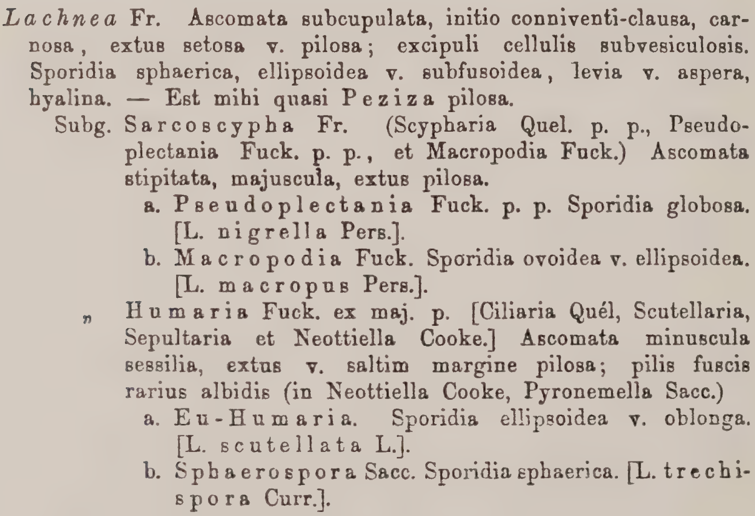
„ Aleuria Fr., Fuck. (Cochlearia C., Plicaria Fuck e. p. Pustularia C. et Fuck. e. p.) Ascomata subsessilia cupulato-cochleata, demum subinde expansa.

a. Eu-Aleuria. Ascomata majora concava; sporidia ellipsoidea v. oblonga. [P. aurantia Oed.].
b. Plicaria Fuck. p. p. Ascomata majora concava; sporidia sphaerica. [P. fulgens Pers.].

FIG. 1. A portion of Saccardo's (1884) treatment of *Peziza*.

What do the species names in square brackets, *Peziza Acetabulum, P. Ciborium, P. onotica,* etc., stand for in this particular case? They are not "first-species" taken from other authors' works, nor previously designated types. They are clearly *selected* species names intended to convey a taxonomic "standard" for the listed taxa. It would greatly simplify many of the questions on types of generic names in Discomycetes to treat these as lectotypifications. They would be among the earliest known lectotypifications in fungi; moreover, these names have immense weight since the whole Saccardo system for Discomycetes in the *Sylloge* has its roots in this paper.

A number of mycologists have assumed these were type designations. For example, Rifai (1968: 109) held that Saccardo had "effectively typified" *Humaria* Fuckel (1870) with *Lachnea scutellata* by listing that species under *Lachnea* subg. *Humaria* [sect.?] a. *Eu-Humaria* (FIG. 2). Rifai was aware that in several instances Saccardo listed not *one,* but two or even more species names following the taxa (two examples are *Phaeopezia* subg. *Plicariella* and subg. *Geoscyphula,* FIG. 3). He was also aware that a careful reading of the *Conspectus* reveals no use of the term *type,* nor any indication there of what the listing of species might mean.



*Lachnea* Fr. Ascomata subcupulata, initio conniventi-clausa, carnosa, extus setosa v. pilosa; excipuli cellulis subvesiculosis. Sporidia sphaerica, ellipsoidea v. subfusoidea, levia v. aspera, hyalina. — Est mihi quasi Peziza pilosa.

Subg. Sarcoscypha Fr. (Scypharia Quel. p. p., Pseudoplectania Fuck. p. p., et Macropodia Fuck.) Ascomata stipitata, majuscula, extus pilosa.

a. Pseudoplectania Fuck. p. p. Sporidia globosa. [L. nigrella Pers.].

b. Macropodia Fuck. Sporidia ovoidea v. ellipsoidea. [L. macropus Pers.].

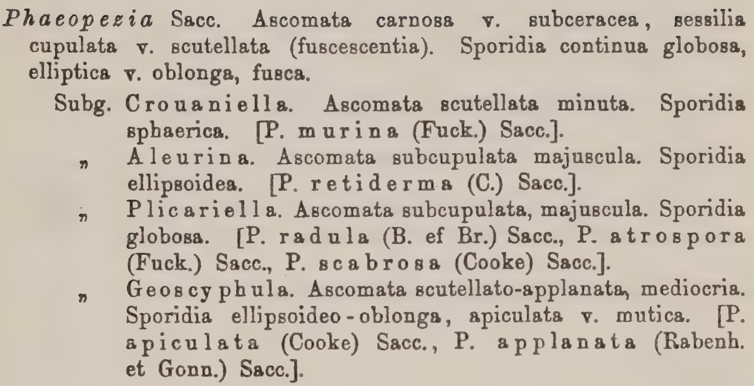
„ Humaria Fuck. ex maj. p. [Ciliaria Quél, Scutellaria, Sepultaria et Neottiella Cooke.] Ascomata minuscula sessilia, extus v. saltim margine pilosa; pilis fuscis rarius albidis (in Neottiella Cooke, Pyronemella Sacc.)

a. Eu-Humaria. Sporidia ellipsoidea v. oblonga. [L. scutellata L.].

b. Sphaerospora Sacc. Sporidia sphaerica. [L. trechispora Curr.].

FIG. 2. Saccardo's (1884) treatment of *Lachnea.*

In an attempt to understand the implications of Saccardo's appended species names, I have consulted other papers by Saccardo. Two point to the apparent solution: Saccardo's (1875) *Conspectus generum Pyrenomycetum Italicorum* and Saccardo's (1880) *Conspectus generum fungorum Italiae inferiorum,* two other pre-*Sylloge* treatments. There, just as in the later



*Phaeopezia* Sacc. Ascomata carnosa v. subceracea, sessilia cupulata v. scutellata (fuscescentia). Sporidia continua globosa, elliptica v. oblonga, fusca.

Subg. Crouaniella. Ascomata scutellata minuta. Sporidia sphaerica. [P. murina (Fuck.) Sacc.].

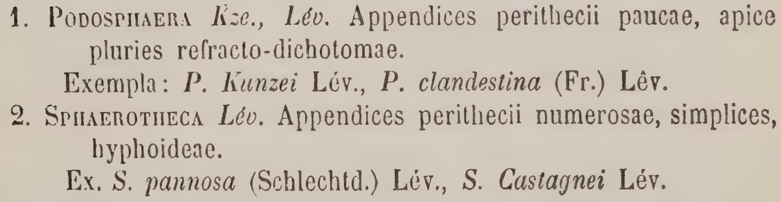
„ Aleurina. Ascomata subcupulata majuscula. Sporidia ellipsoidea. [P. retiderma (C.) Sacc.].

„ Plicariella. Ascomata subcupulata, majuscula. Sporidia globosa. [P. radula (B. ef Br.) Sacc., P. atrospora (Fuck.) Sacc., P. scabrosa (Cooke) Sacc.].

„ Geoscyphula. Ascomata scutellato-applanata, mediocria. Sporidia ellipsoideo-oblonga, apiculata v. mutica. [P. apiculata (Cooke) Sacc., P. applanata (Rabenh. et Gonn.) Sacc.].

FIG. 3. Saccardo's (1884) treatment of *Phaeopezia.*

*Conspectus generum Discomycetum,* each generic or infrageneric name is followed by one — or sometimes by more than one — species name. The difference is that in the 1875 and 1880 papers these species indications are preceded by "Exempla," "Exempl.", or "Ex." (FIGS. 4, 5). These then, are *examples,* and not *types.*

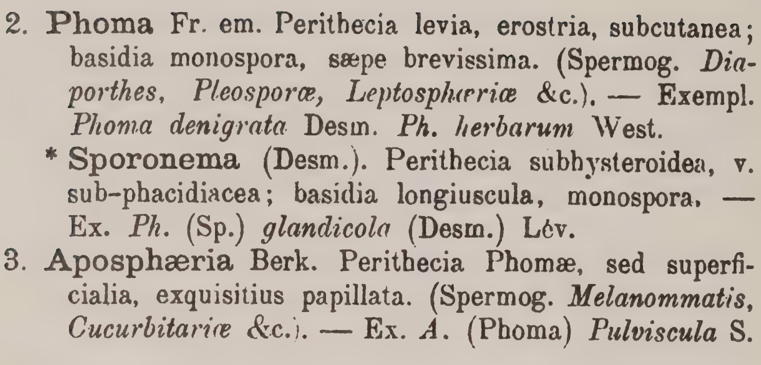


1. PODOSPHAERA *Kze., Lév.* Appendices perithecii paucae, apice pluries refracto-dichotomae.
   Exempla: *P. Kunzei* Lév., *P. clandestina* (Fr.) Lév.
2. SPHAEROTHECA *Lév.* Appendices perithecii numerosae, simplices, hyphoideae.
   Ex. *S. pannosa* (Schlechtd.) Lév., *S. Castagnei* Lév.

FIG. 4. Saccardo's (1875) treatment of *Podosphaera* and *Sphaerotheca.*

In regard to Saccardo's 1884 paper, Rifai (1968: 109) wrote:

> "It is true that Saccardo did not explicitly state that the 'example' cited for each taxon in the scheme of classification proposed by him was a type species, but it is very difficult to escape from the conclusion that the listing of this example species was to indicate what in his opinion was the most typical representative of the taxon concerned."



2. **Phoma** Fr. em. Perithecia levia, erostria, subcutanea; basidia monospora, sæpe brevissima. (Spermog. *Diaporthes, Pleosporæ, Leptosphæriæ* &c.). — Exempl. *Phoma denigrata* Desm. *Ph. herbarum* West.
   * **Sporonema** (Desm.). Perithecia subhysteroidea, v. sub-phacidiacea; basidia longiuscula, monospora. — Ex. *Ph.* (Sp.) *glandicola* (Desm.) Lév.
3. **Aposphæria** Berk. Perithecia Phomæ, sed superficialia, exquisitius papillata. (Spermog. ***Melanommatis***, *Cucurbitariæ* &c.). — Ex. *A.* (Phoma) ***Pulviscula*** S.

FIG. 5. Saccardo's (1880) treatment of *Phoma*, *Phoma* [subg.] *Sporonema*, and *Aposphaeria*.

I thoroughly agree with Rifai's conclusion, but "typical," "representative," or "example" simply *do not qualify* under the Code as lectotypification!

To bolster his opinion, Rifai noted that:

> "Korf (1953) and Dennis (1956), for example, have treated the example species listed [by Saccardo] for *Velutaria* Fuckel and *Calycella* (Fr.) Boud. as effective typifications, respectively."

In defence, let me point out that I certainly did not base my argument on the 1884 paper alone. The genus originally contained two species, *Velutaria griseo-vitellina* and *V. rufo-olivacea*, neither designated the type by Fuckel (1870). In the 1884 paper Saccardo mentioned only the one *(V. griseo-vitellina)*. I wrote (Korf, 1953) that:

> "Saccardo was apparently the *first to divide the genus*[1]. In 1884 he emended the genus, designating *V. griseo-vitellina* the type. He followed this in 1889 by leaving *V. griseo-vitellina* in the genus (adding two further species), and relegated *V. rufo-olivacea* to the genus *Lachnella* 'Fries.' He unquestionably selected a lectotype *by this division*[1]."

No longer would I contend that he designated the type in 1884, but rather that he designated the type in 1889, at the time the two eligible syntypes were separated *in a single paper* under different generic names. This was one of the classic cases we had in mind when we proposed the concept of *implicit typification* (Korf & Rogers, 1967) that has now become accepted as a part of the ICBN. Our correspondence with Rifai over this very issue had helped crystallize that concept.

Dennis (1956: 66) also, it is true, wrote that Saccardo had "designated" a type species, for *Calycella*, in 1884.

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[1]. Italics added here.

When Korf & Carpenter (1974) revised *Calycella* they did not accept Saccardo's (1884) mere listing as typification of the name.

Eckblad (1968) is another author who has erroneously accepted at least some of Saccardo's listings as typifications. In treating *Saccobolus*, for example, Eckblad (1968: 31) unequivocally stated: "Saccardo (1884) also had selected the same [species] as the type."

Nevertheless, at least one of Saccardo's listings in the *Conspectus generum Discomycetum* really does constitute lectotypification (implicit!) by virtue of this being the first place where *all* of the syntypes are treated and only one is retained under the generic or infrageneric taxon. That example is *Pseudoplectania* Fuckel (1870), originally erected with two syntypic species, *P. nigrella* (Pers.) Fuckel and *P. fulgens* (Pers.) Fuckel. Saccardo treated the first under *Lachnea* subg. *Sarcoscypha* [sect.?] a. *Pseudoplectania* Fuckel *pro parte* (FIG. 2), and the second under *Peziza* subg. *Aleuria* [sect.?] b. *Plicaria* Fuckel *pro parte* (FIG. 1). All (both) eligible syntypes were treated in this one publication, and only one was left with its original generic name (now at infrageneric rank).

Thus, convenient as it would be, we cannot take the mere listings of species names in any of Saccardo's three *Conspecti* as lectotypifications in the absence of the words "type" or "typification." These undoubtedly represent "central" or "standard" species around which taxonomic concepts were built, but they do not stand scrutiny as nomenclatural building blocks. Except for one or a few cases of implicit lectotypification, we must look elsewhere for effective explicit typification of generic names for fungi.

## *ACKNOWLEDGEMENTS*

I continue to owe a great debt to my former student, Joanne K. Rogers, whose insight into nomenclature remains an inspiration to me. Her unpublished notes on generic names in the Pezizales have been of great use to me in preparing this paper. Prof. Donald H. Pfister, Farlow Herbarium, Harvard University, has supplied me with a copy of the 1875 paper by Saccardo. Financial support of National Science Foundation grant DEB75-23557 is gratefully acknowledged.

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# FOLIICOLOUS ASCOMYCETES 2:
# CAPNODIUM SALICINUM MONTAGNE EMEND.

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## ABSTRACT

Capnodium salicinum Montagne is redescribed from type material. The species concept is discussed and a centrum type for Capnodium Montagne emend. is described.

The name Capnodium was used by Montagne (1849a) to designate a "nov. gen." taxon. The description mentioned a teliomorphosis characterized by a gelatinous-absorptive centrum, ovoid-claviform asci which became deliquescent, and dark muriform ascospores. The distribution was considered to be temperate, including Australia, North America and middle to southern France. A name based on sterile material, Fumago citri Turpin, was cited under "typus" and Capnodium salicinum Montagne was referred to as an allied species where the ascus and ascospores were first observed. "Typus" was enlarged to include mention of two additional nomen anamorphoses in a modified description published by Montagne (1849b) in an English publication; this citation was used by Berkeley and Desmazieres (1849) for Capnodium salicinum Montagne. A third description of the species was published by Montagne in 1856 as #915 in a Sylloge of Cryptogams.

Berkeley and Desmazieres (1849) enlarged Montagne's genus to 10 species. Asci and ascospores were mentioned in two of the species and in two others, spores were stated to be completely unknown. Saccardo (1882) recorded 35 names in the genus Capnodium in the first volume of Sylloge Fungorum; asci and ascospores were recorded in only four species. Fifty-four species were indexed under Capnodium in Saccardo's 12th volume (1897). The 1971 edition of Ainswroth and Bisby's Dictionary of the Fungi gives the estimated number of species as 25.

A major point of confusion in early descriptions was the nature of the ostiole. Montagne (1849a) attributed pycnidial characters to the ascocarp, according to Tulasne and Tulasne (1863) and Arnaud (1911). The Tulasne brothers elaborated the description of C. salicinum and described the ostiolar opening as slimy. They presented an illustration which gave the impression, however, that the ascocarp was astomatous by depicting the asci as coming from the ascocarp through cracks. They referred to the illustration as occurring during preparation of the microscope mount.

Saccardo (1882) gave a description of the asci of Capnodium as aparaphysate. Von Hoehnel (1906) mentioned a nucleus for species of his "Capnodieen" which, ". . .ist durch starke Verschleimung der Paraphysen knorpelig-gelatinos." He indicated that the asci are dispersed via a slit ascocarp peridium.

Barr (1976) following Henssen and Jahns (1974) used the term periphysoid to indicate the type of sterile element which is present in the centrum of Capnodium. The origin of periphysoids in C. salicinum is similar to that reported for Scorias (Reynolds, 1978). In S. spongiosa Fries, the periphysoids are flexible elongations of the cells lining the ascocarp cavity. The tips remain free. They initially extend laterally and then are reoriented during ascus discharge so as to extend upward into the ostiolar region. The periphysoids are not paraphyses in that the origin is not hymenial. They are not pseudoparaphyses sensu Luttrell (1955). The periphysoids in S. spongiosa and C. salicinum extend from the locule wall so as to somewaht surround the upper regions of the ascus. Periphysoids are also known to occur in ascocarps of other foliicolous fungi. I examined material of Limacinia (=Metacapnodium) juniperi which I collected from the type locality and determined that the sterile elements produced in the ascocarp are capnodiaceous periphysoids; Corlett (1970) illustrated and referred to these structures as pseudoparaphyses. I examined material of Limacinia fernandeziana Neger from the type locality and found capnodiaceous periphysoids. I also found these sterile elements in Florida collections of Treubiomyces pulcherrimus von Hoehnel; this observation was confirmed by Pohlad (1977). My examinations of neotropical collections indicated that the Capnodium type of periphysoid is also produced in ascocarps of Limacinula javanica (Zimmerman) von Hoehnel, L. musicola (Batista) Reynolds, and L. samoensis von Hoehnel.

Earlier, I (Reynolds, 1975) reported "periphyses" in the centrum of L. samoensis. After studying ascocarps produced in pure culture, I found that the maturing asci were separated by, ". . .interascal strands . . .," which originated, ". . .in the same manner as do paraphysoids (Luttrell, 1965), i.e. correspond to the compressed tissue of Pseudosphaeria centrum fide von Hoehnel . . ." I found that these tissue strands eventually disintegrated, and the hymenium occupied a single chamber within the ascocarp. I suggest that my earlier interpretation of the Limacinula ascocarp was biased by study of those produced in an artificial culture environment; more observations from naturally occurring ascocarps would have shown the extensive periphysoids in species of this genus.

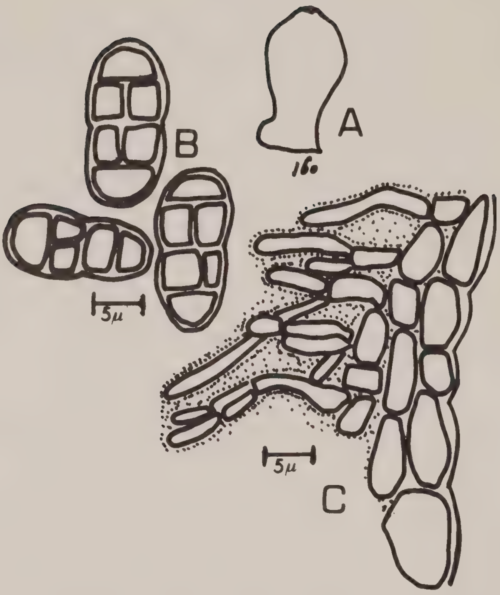
The bitunicate ascus is generally recognizable by an apical configuration termed "nasse apicale" by M. Chadefaud and explained by Reynolds (1971). The separation of the endoascus of the ascus wall from the exoascus also confirms the presence of a bitunicate ascus, but is not often observed. Aside from a lighter blue intensity produced by the Kohn-Korf or KOH-iodine protocol (Kohn and Korf, 1975) for a positive reaction, the 130 year-old material I examined of C. salicinum was typical of that I have observed in other, neotropical foliicolous Ascomycete species. The wall of the young ascus stains more intensely than does the more mature endoascus. I am convinced that only the exoascus is Kohn-Korf positive. Penetration of iodine through the thickened ascus wall is evidenced by the accumulation of iodine in cytoplasm of an ascus with immature spores, and in spores.

The anamorphic state is regarded as incertus because of lack of positive proof that an anamorphosis is present in the life cycle of C. salicinum. Acceptable criteria of positive proof of pleomorphism are (1) spore-to-spore cultivation in pure culture, (2) spore germination to produce a different type of spore form in pure culture, (3) use of a chronologically obtained series of collections from a single locale to analyze fruit body development. None of these criteria was met with the material at hand.

Positive proof of alternate reproductive modes of the holomorphosis has been the focus of taxon definition only in contemporary work. By contrast, the genus Capnodium was conceived in 1849 from a teliomorphosis and anamorphoses which had no demonstrated life cycle relationships. Prime taxonomic significance in this historical taxon was given to general appearance of the fungi comprising the leaf surface colony. Arnoud (1911) wrote of Capnodium that the habitat, ". . .has no systematic value in most cases. It generally depends on the condition of the environment. The result was the formation of a heterogenous group."

The original grouping together of discordant elements was perpetuated by other 19th-century mycologists including Berkeley and Desmazieres (1849), Saccardo (1882, 1892), and Ellis and Everhart (1890). The name of the genus and its type species have been variously applied, but with a distinct limitation to certain sooty mold fungi. Although the holomorphosis was based on a type consisting of discordant reproductive elements, the ascocarp is easily identifiable. I use discordant in a reproductive sense to indicate that the teliomorphosis has not been unquestionably proven to be associated holomorphically with any anamorphosis.

The name Capnodium stands, with C. salicinum Montagne emend. Reynolds as its type. Measurements were



*Capnodium salicinum*. Camera lucida drawing from type material. A. Sketch in Montagne packet of fruit body. B. Ascospores. C. View of laterally positioned periphysoids, originating from cells lining ascocarp locule, surrounded by gelatinoid wall material.

taken at maximum limits or width of ascocarp components. The asci were measured in length only due to width distortion inherent in slide making. The color of the ascospores was noted in mature spores before discharge while they were still in the ascus. Discharged ascospores are distinguishable as such only with extreme difficulty from among other components of the foliicolous habitat.

## REDESCRIPTION

*Capnodium* Montagne emend.

=*Capnodium* Montagne. 1849. Ann. Sci. Nat. Ser. 3, 12:233-234. *Pro parte*, teliomorphosis only.
=*Capnodium* Montagne. 1849. Ann. Mag. Nat. Hist. London, Ser. 2, 3:520. *Pro parte*, teliomorphosis only.
=*Capnodium* Montagne section *Eucapnodium* Saccardo. 1882. Sylloge Fungorum 1:73. *Pro parte*, teliomorphosis only.
NON *Fumago* section *Polychaeton* Persoon. 1822. Mycologia europeae. Sectio prima. Erlangse 1:9.

Teliomorphosis- ascocarp subtended by stalk, ostiolate; periphysoids present lateral to apical on inner surface of locule wall; ascus bitunicate, nasse apicale present, staining blue in KOH-iodine; ascospores pigmented, muriform.

Anamorphosis- *incertus*.

Type- *Capnodium salicinum* Montagne emend. Reynolds

## REDESCRIPTION

*Capnodium salicinum* Montagne emend. Reynolds

=*Capnodium salicinum* Montagne. 1849. Ann. Sci. Nat. Ser. 3, 12:233-234. *Pro parte*, teliomorphosis only.
=*Capnodium salicinum* Montagne. 1849. Ann. Sci. Nat. Hist. London, Ser. 2, 3:520. *Pro parte*, teliomorphosis only.
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=*Capnodium salicinum* Montagne. 1858. Syll. gen. spec. cryptog. etc. J. B. Bailliere, p. . *Pro parte*, teliomorphosis only.
=*Capnodium salicinum* Montagne emend. Saccardo. 1882. Sylloge Fungorum 1:73-74. *Pro parte*, teliomorphosis only.
=*Apiosporium salicinum* (Persoon) Kuntz. 1897. Die Natur. Pfl. 1(4):337. Pro parte, teliomorphosis only.
NON *Fumago citri* Turpin. 1833. Mem de Nosl. Veget. in in Mem. Ac. Sc. de Paris. sav. etr. 6:240.

Teliomorphosis- ascocarp subtended by stalk measuring 75-113 mμ x 75-163 mμ , ostiolate; portion surrounding hymenial locule ovate, measuring 100-125 mμ x 120-140 mμ comprised of textura angularis tissue, with component cells containing dark brown pigment in wall; periphysoids hyaline, branched, measuring 10-25 mμ x 2-3 mμ; hymenium basal, aparaphysate; asci up to 50 mμ in length, originating from cells of basal tissue mass, functionally bitunicate, nasse apicale present, KOH-iodine positive; ascospores 8 per ascus, walls containing dark brown pigment when mature in ascus; septation muriform, three cross septa, the middle septum slightly shorter in width than the other two, longitudinal septa several, measuring 17-20 mμ x 7-10 mμ.

Anamorphosis- *incertus*.

Type- Located in Paris (P); slide preparation kept in LAM.
Collector: M. Durieu
Location: Versailles, France.
On: "Salicinia" leaves

Material examined- Type (LAM200472); P (LAM200478).
Collector: M. Durieu.

Location: Sarision
On: "Salicinia capraeae" leaves.

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# RECORDS OF PARASITIC FUNGI OF THE "THAXTERIOLAE" GROUP ON SUBCORTICAL MITES

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## SUMMARY

Parasitic fungi of the group Thaxteriolae were located on mites collected from bark-beetle galleries in Louisiana. These fungi closely resemble a species described from Poland. A more detailed treatment of the American specimens requires, however, the study of more extensive material.

External fungal parasites are frequently found on mites (Acarina). Best known among these are fungi of the order Laboulbeniales (class Ascomycetes), where about 30 species have been described from mites. Other external parasites of mites were classified by Thaxter (1920) in the group "Thaxteriolae" (incertae sedis), characterized by a much simpler structure than that of Laboulbeniales. Thaxter (1920) mentioned the occurence of an undescribed species of the genus *Thaxteriola* on gamasid mites. The systematic investigation of the acarofauna in bark-beetle galleries, carried on for several years in Poland, allows the detection and identification of several species of these interesting fungi. Majewski and Wiśniewski (1978) described a new species, *Thaxteriola moseri*, and two species belonging in the new genus *Acariniola*, *A. basalipunctata* and *A. subbasalipunctata* (Fig. 1). Each of these fungi is characterized by an elongated fusiform thallus, small dimensions (length up to 54 μm, breath up to 8 μm). They are attached to the host by an almost black roundish foot situated in the lower part of the basal cell of the thallus. In the foot of *Thaxteriola moseri* there is a small round orifice (Fig. 1a), a penetration pore through which the fungus comes into contact with the host's body. In the species of *Acariniola*, the penetration pore does not lie within the foot, but separately and somewhat higher (Fig. 1b,c). The above-mentioned genera also differ by the number of cells in the thallus - two in *Acariniola* and three in *Thaxteriola*. The spores of fungi of the Thaxteriolae group are unicellular; they form within the upper cell and emerge through an opening in the top.

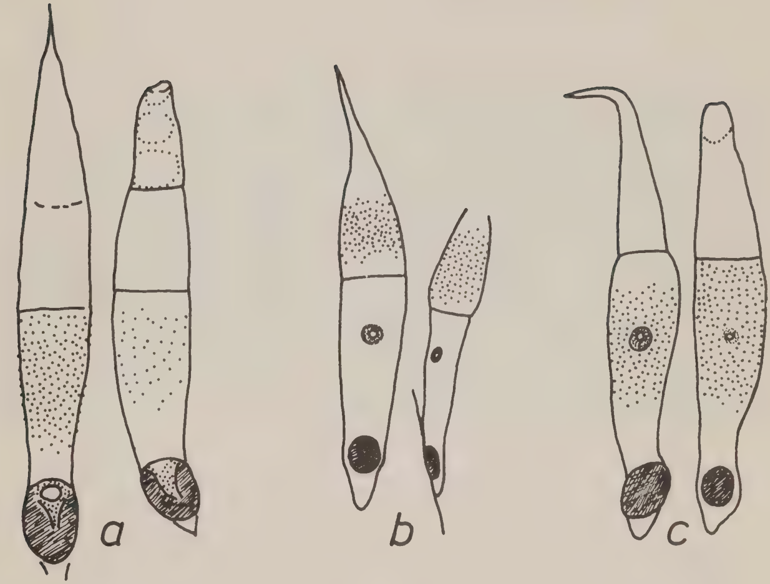

Fig. 1. Parasitic fungi from the Thaxteriolae-Group: a-*Thaxteriola moseri* Majewski et Wiśniewski, b - *Acariniola subbasalipunctata* Majewski et Wiśniewski, c - *A. basalipunctata* Majewski et Wisniewski (Majewski and Wiśniewski, 1978, fragment).

Fungi of the Thaxteriolae group on mites have not yet been studied in detail in North America. A series of slides received from Dr. John C. Moser from the USDA Southern Forest Experiment Station, Pineville (Louisiana) shows species collected from bark beetle galleries and ant nests. The material was collected near Elizabeth, Louisiana from a female of *Ameroseius longitrichus* Hirsch. on June 14, 1965 (slide No. 4,996), on a deutonymph (slide No. 10,999), and on a female of *Dendrolaelaps rotoni* Hurlb. on June 1, 1966 (slide No. 10,835) from galleries of *Dendroctonus frontalis* Zimm. Specimens were also recorded from a deutonymph of *Dendrolaelaps quadrisetosimilis* Hirsch. (slide No. 6,066), a female of *Lasioseius corticeus* Lindq. (slide No. 6,294), and a female of *Uroobovella americana* Hirsch. (slide No. 6,124) found in bark beetle galleries of *Ips avulsus* (Eichh.) on April 24, 1965 (Fig. 2). Several specimens of these fungi occured on one host. They resemble the Polish *Thaxteriola moseri* described by us, and young specimens with a colorless wall are identical with our specimens. The few (about 20) more mature fungi have a thallus almost completely covered with small verrucae and are light brown. They differ in these respects from typical *T. moseri* in which

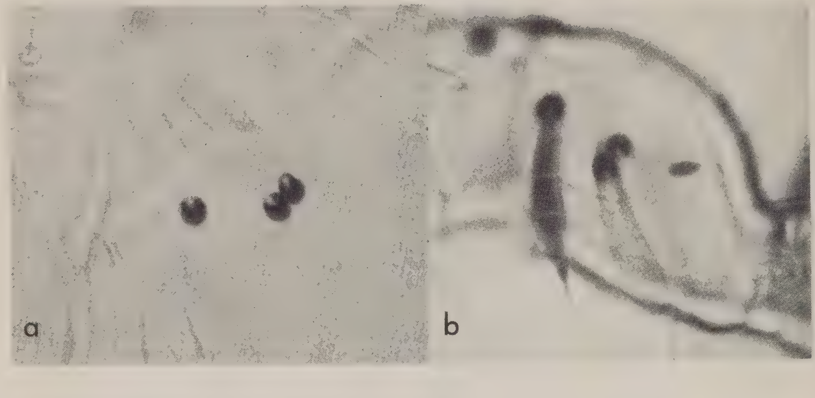

Fig. 2. Parasitic fungi from the Thaxteriolae-Group on mites gathered in Louisiana: a - on a deutonymph of *Dendrolaelaps quadrisetosimilis* Hirsch., b - on a female of *Uroobovella americana* Hirsch. (Photograph, A. Sokołowski).

only the basal cell is colored and verrucose. Their dimensions are frequently somewhat larger, 36-72 x 5-8 µm (*T. moseri:* 41-54 x 4.5-6 µm). Final determination of the American specimens requires studies of more extensive material; it is possible that they belong to a new species *Thaxteriola*. It is also possible after investigations on a wider scale, more new species of these fungi will be found. A more exhaustive treatment of the taxonomy and biology of the parasitic Thaxteriolae group can be undertaken only when these fungi attract the attention of a large number of acarologists and entomologists. We hope that our note will contribute in some extent to this.

Finally, we wish to thank the U.S. Department of Agriculture for a grant to encourage these investigations under contract FG-Po-292, and the sponsor, Dr. John C. Moser.

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# NOTES ON THE GENUS *PANELLUS*

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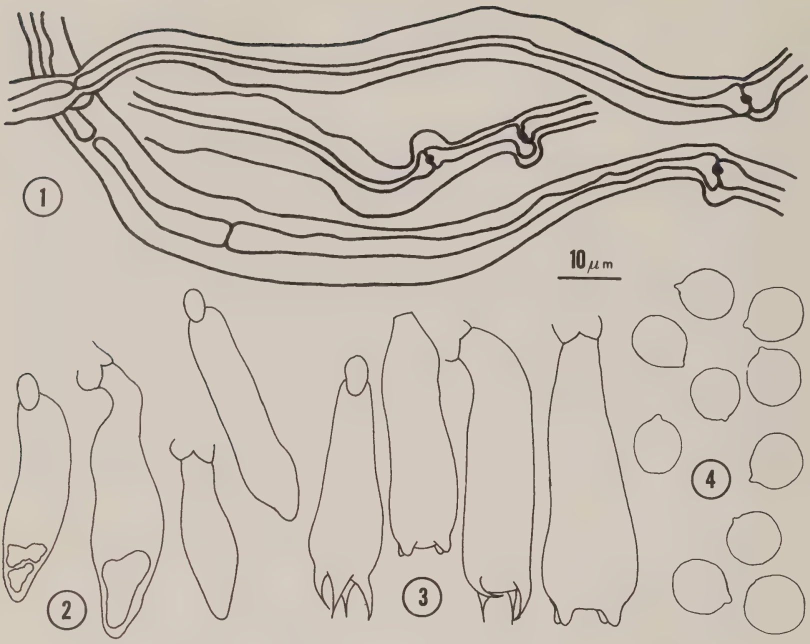
A new combination in *Panellus* is proposed for *Dictyopanus orientalis*. Erroneous information previously published on cultural characters and mating compatibility of *P. pusillus* and *P. stipticus* is corrected. Three *Dictyopanus* taxa are put in synonymy with *P. pusillus* and the location of type specimens of two others is discussed.

## INTRODUCTION

Burdsall and Miller (1975) treated the genus *Panellus* Karst. and included two species formerly in *Dictyopanus* Pat. When that work was published the type specimens of several other species were not yet available for study. Some of these have since been located and deserve comment. In the same paper information was presented concerning single spore isolates and the mating compatibility between *P. stipticus* (Bull. per Fr.) Karst. and *P. pusillus* (Pers. per Lév.) Burds. et Miller. Some of that information was erroneous and is corrected below.

I. *Panellus orientalis* (Kobay.) Burds. et O.K. Miller, Jr., comb. nov.
≡ *Dictyopanus orientalis* Kobay., Bull. Nat. Sci. Mus. Tokyo 6:360. 1963. Figs. 1-4.

Basidiocarps gregarious; pileus 1-3.5 x 2-4.5 mm, broadly reniform to orbicular, convex to planate, with depression at stipe attachment, white (reddish-brown when dried) reviving when moistened, surface dry, smooth to pubescent, nonluminescent (Kobayasi 1963, p. 361). Hymenophore poroid, pores about 3 per mm, less than 1 mm long, nearly circular, edges entire, pale tan. Stipe lateral, up to 2 x 1 mm, dry, pubescent, concolorous with the pileus.



Figures 1-4.--Line drawings of microscopic structures of *P. orientalis*.
1. contextual hyphae. 2. cystidia. 3. basidia.
4. basidiospores.

Basidiospores (Fig. 4) globose to subglobose, 7-9.5 x 7-8.5 μm, smooth, thin-walled, apiculate, hyaline in $H_2O$ and KOH, amyloid (walls blue) in Melzer's reagent; basidia (Fig. 3) broadly clavate to nearly cylindrical, 30-45 x 9-12 μm, hyaline, thin-walled, clamped at base, 4 sterigmate, sterigmata up to 6 μm long; pleurocystidia 28-40 x 6.5-9 (-12) μm nearly fusoid to cylindrical and tapered rather sharply to apex, hyaline, thin-walled, clamped at base, often with one or more large globular inclusions; dichohyphidia covering dissepiment much branched, hyaline, thin-walled, clamped, often acanthophysoid, also with flexuous cells up to 5 μm diam, thin-walled hyaline, with refractive content staining densely in 2% KOH-phloxine, more numerous here than in pileus cuticle.

Cuticle of pileus a loose *textura intricata*, hyphae 2-3.5 μm diam, hyaline, thin-walled, clamped, ends of hyphae differentiating into acanthophysoid-like cells, with scattered, densely staining hyphal end-cells up to 5 μm diam, thin-walled, hyaline, with refractive content; cuticle continues over margin and onto dissipiments; context of pileus up to 125 μm thick, a compact *textura intricata*; hyphae (Fig. 1) 5-10 μm diam, hyaline, thick-walled (walls up to 3.5 μm thick), not equally thickened throughout hypha, resulting in appearance of the lumen wandering from one side of hypha to other, refractive, wall surface undulating or sometimes appearing eroded; pore trama like context; subhymenium only 2-3 cells thick, hyphae 2-3 μm diam, hyaline, thin-walled, clamped, smooth.

SPECIMEN EXAMINED: TNS-F-193006, Oosumi, Kagoshima Pref. Japan 17. IX. 1962. K. Aoshima 341. (HOLOTYPE-ex TNS)

REMARKS: The amyloid smooth spores, thick-walled refractive contextual hyphae and the structure of the cutis and lateral attachment of stipe support the placement of *P. orientalis* in the genus *Panellus*. According to Kobayasi (1963, p. 361) the basidiocarps are not luminescent, but since luminescence does not appear to be a constant characteristic in *Panellus* (Burdsall and Miller, 1975) that feature alone does not exclude it from the genus.

## II. On single spore isolates and compatibility

Because of an error in labeling single spore isolates when mating compatibility was being investigated, *P. pusillus* was paired with *Pleurotus sapidus* (Schulzer) Kalchbr., not *Panellus stipticus* as reported (Burdsall and Miller, 1975). This error was recognized when the compatible intra-specific crosses fruited just prior to the appearance of the volume, which could no longer be corrected. The information on the mating studies, therefore, is not valid. The description of the single spore isolates of *P. stipticus* are, instead, descriptions of those of *Pleurotus sapidus*. Since discovering this error we have obtained new single spore isolates of *Panellus stipticus* and paired them with single spore isolates of *P. pusillus*. The pairings resulted in no clamp connection formation in any of the matings performed, indicating that the two species are distinct.

## III. On some *Dictyopanus* species

Burdsall and Miller (1975) cited six *Dictyopanus* names for which type specimens were unavailable. *Dictyopanus orientalis* was one of these and is discussed above. The holotypes of three other names-- *D. pusillus* var. *sublamellatus* Corner (1954, p. 259), *D. gloeocystidiatus* Corner (1954, p. 258) and *D. pusillus* var. *pseudorhipidium* Singer (1953, p. 14)--were studied and found to be specimens of *P. pusillus*. The holotypes of *D. luminescens* Corner (1954, p. 423) and *D. foliicolus* Kobay. (1963, p. 361) are apparently not extant. Corner (pers. comm.) was unable to locate the type of *D. luminescens* in his collection and indicated that it may be at SING but it is reportedly not on deposit there. According to Dr. Doi at TNS (pers. comm.), the type specimen of *D. foliicolus* is in none of the Japanese herbaria. He indicated the same to be true of most Philippine plant specimens collected during World War II. Two other names for which we could not find holotypes are *D. flabelliformis* Kobay. and *D. illuminans* Corner (Kobayasi 1951, p. 4).

## ACKNOWLEDGMENTS

The herbaria which loaned (TNS) or searched (SING) for specimens are acknowledged with greatest appreciation. The information and specimens supplied by Drs. E.J.H. Corner and Y. Doi are gratefully acknowledged. Thanks are also offered Mr. Steven P. Bradbury for his technical assistance and Drs. J. Ammirati, M. J. Larsen, E. L. Stewart, and Mrs. F. F. Lombard who critically reviewed this manuscript.

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# THREE NEW SPECIES OF PSILOCYBE FROM THE PACIFIC-NORTHWEST IN NORTH AMERICA

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The mycoflora of Northwestern United States and Southwestern Canada contains relatively few endemic species of Psilocybe: P. washingtonensis Smith (1946), P. angustispora Smith (1946), P. baeocystis Singer & Smith (1958), P. pelliculosa (Smith) Singer & Smith (1958), and P. stuntzii Guzmán & Ott (1976). Other species known from the area but not endemic to it are P. cyanescens Wakefield, P. semilanceata (Fr. ex Secr.) Kummer (Guzmán et al, 1976), and P. moelleri Guzmán (1978). It is interesting to note that of the 180 taxa recognized in the genus by Guzmán and Vergeer (1978), only 8 are known to occur in the Northwest, six of which stain blue and are presumably hallucinogenic, and that two do not stain blue and presumably are not hallucinogenic.

In the present paper we are describing three new species, one of which stains blue and presumably is hallucinogenic. Two do not stain blue.

We wish to express our thanks to G.P. Menser and D.T. Leslie for providing information on some of the collections described here. Thanks are also due to Dr. Roy Watling, Royal Botanic Garden Edinburgh, Scotland, for the loan of type material of Psilocybe fimetaria. Guzmán is pleased to aknowledge a grant from the Guggenheim Memorial Foundation for the study of Psilocybe which was awarded in 1971.

Psilocybe laticystis Guzmán & Smith, sp. nov.

Pl. 1, upper fig.

Pileus 10-35 mm latus, convexus demum campanulatus vel subumbonatus, laevis, glaber, udo striatus, subviscidus, vinaceo-brunneus vel triste castaneus, hygrophanus, demum pallide griseo-brunneus. Lamellae late adnate, subdecurrentes, vinaceo-brunneus, demum obscurior. Stipes 20-45 (-60) x 1-3 (-4) mm, triste vinaceo-brunneus, deorsum subatratus, griseofibrillosus. Sporae in cumulis atrobrunneae, (5.5-) 6-6.6 (-7.7) x(-3.3) 3.8-4.4 um, ellipticae vel subovatae, truncate. Pleurocystidia 30-49 (-60) x 10-19 um. Specimen typicum in Herb. Univ. Mich. conservatum est; legit prope Grants Pass, Oregon, Nov. 10, 1956, Smith 55383 (isotype in ENCB).

Pileus 10-35 mm broad, convex becoming campanulate to subumbonate, expanding to nearly plane, smooth, striate by transparence on margein when moist, viscid to subviscid fresh, color dull vinaceous brown to dark chestnut or chocolate brown, hygrophanous, fading from the margin to the disc to a grayish tan. Context thin, fragile to pliant, taste mild, odor none.

Lamellae broadly adnate to subdecurrent, dull brown to "Rood's brown" (dark vinaceous brown), becoming chocolate brown, edges even and concolor.

Stipe 20-45 (-60) x 1-3 (-4) mm, central, equal or narrowed to the base, "Rood's brown" below and paler above, soon blackish brown from the base upward, with a grayish mycelial pad at the base and surface covered overall by grayish fibrils. Veil not well developed, white-fibrillose and on the upper part of the stipe and on margin of pileus at first but all traces soon obliterated.

Spore print dark chocolate color. Spores (5.5-) 6-6.6 (-7.7) x (3.3-) 3.8-4.4 um, elliptic to subovoid both in face and profile view, smooth, thin-walled, with a broad apical pore, yellowish brown in KOH.

Basidia 18-25 x 5.6-7 um, 4-spored, hyaline, subcylindric with a median constriction. Pleurocystidia 30-49 (-60) x 10-19 um, abundant, hyaline, thin-walled, lageniform to obclavate, the neck moniliform or strangulate, 4-6 um wide at apex, some with a hyaline globule adhering near the apex or on it. Cheilocystidia 13-30 x 8-13 um, hyaline, subventricose or ventricose-mucronate.

Subhymenium formed by elongated hyphae 4-8 um diam., with a diffuse brownish orange pigment. Tramal hyphae parallel, hyaline to brownish with some incrustations of orange-brown pigment, thin to thick-walled, 6-17 um diam. Cuticle of pileus an ixocutis, the hyphae elongate, and hyaline. Hypodermium not distinct from the trama proper. Clamp connections present.

Habitat and distribution. Gregarious on sticks or logs of conifer wood. Known only from Oregon and Idaho in the United States.

Material studied. IDAHO: Upper Priest River, Oct. 16, 1964, Smith 71298 (MICH); Oct. 1, 1966, Smith 73814 (MICH); Oct. 27, 1969, Smith 73670 (MICH). OREGON: Grant Pass, Nov. 10, 1956, Smith 55383 (type, MICH; isotype, ENCB).

Discussion. This species is close to *P. washingtonensis* Smith, but differs in the cheilocystidia; *P. washingtonensis* has two types of cheilocystidia, the first type fusoid-ventricose with obtuse to subacute apices, 26-38 x 7-11 um and the second type broadly clavate to capitate, 18-26 x 10-12 um. For further comment see discussion of *P. subborealis*.

### *Psilocybe subborealis* Guzmán & Smith sp. nov.

Pl. 1, lower fig.

Pileus 15-20 mm latus, convexus vel subumbonatus, laevis, substriatus; sapor mitis. Lamellae latae, adnate, demum violaceo brunneae. Stipes 25-38 x 1-2 mm, subflexuosus, sursum pallidus, deorsum sordide vinaceo brunneus; pallide sericeofibrillosus. Sporae (5.5-)6-6.6 (-7.1) x (3.3-) 3.8-4.4 um, ellipsoideae vel subovoideae, in KOH luteobrenneae. Basidia tetraspora vel rare bispora. Pleurocystidia 19.6-33 x 10-13.5 (-16) um, fusoide ventricosa vel clavate mucronata vel clavata, apice 3-4 um lata; hyalina. Cheilocystidia 18-30 x 8-10 um, fusoide ventricosa. Cuticula pileorum gelatinosa. Specimen typicum in Herb. Univ. Mich. conservatum est; legit prope Priest Lake, Idaho, 5 Oct. 1956, Smith 54068 (isotypus in ENCB).

Pileus 15-20 mm broad, convex to subumbonate, smooth, slightly striate at the margin by transparence when moist, when faded ± sulcate, viscid at first, margin silky at first but soon glabrous overall, dark reddish brown (± "Warm Sepia"), hygrophanous, fading to cinnamon buff to dull orange-buff. Context thin, concolor with pileus, taste mild, odor none.

Lamellae broadly adnate, dark cocoa-color, becoming violaceous brown, edges concolorous or ± paler than the faces.

Stipe 25-38 x 1-2 mm, central equal or at base slightly thickened, somewhat flexuous, lower part cocoa-color, paler above, whitish or gray-silky ± over all from a thin fibrillose veil.

Spores (5.5-) 6-6.6(-7.1) X (3.3-) 3.8-4.4 um, ellipsoid to subovoid both in face and profile view, smooth, thin-walled, brownish in KOH, with apical pore distinct.

Basidia 13-22 x 6-7 um, 4-spored (rarely some 2-spored), subventricose, hyaline. Pleurocystidia 19.6-33 x 10-13.5 (-16) um, common, ventricose or some clavate, or mucronate (shape regular or versiform), apex 3-4 um wide, hyaline or in some yellowish at apex. Cheilocystidia 18-30 x 8-10 um, hyaline, ventricose, somewhat mucronate in some, neck at times with one or more constrictions (moniliform or "strangulated").

Subhymenium hyaline but with an ochraceous-brown pigment irregularly distributed but very abundant. Gill trama of parallel-interwoven hyphae, hyaline to brownish, hyphae 6-11 um diam., thin-walled, with pigment irregularly distributed on the walls. Cuticle of pileus an ixocutis, the hyphae narrow, appressed and hyaline; hypodermial zone not differentiated from pileus trama. Clamp connections present.

Habitat and distribution. Gregarious to scattered on conifer sticks and debris. Known only from Northern Idaho.

Material studied. IDAHO: Boundary County, Priest Lake, Oct. 5, 1956, Smith 54068 (type, MICH; isotype, ENCB).

Discussion. This species is distinguished from the latter by the shorter broader no lageniform pleurocystidia. P. subborealis and P. laticystis together with P. washingtonensis Smith are very similar in general appearance; even they are closely related with P. crobula (Fr.) M. Lange ex Sing., but differ in presence of pleurocystidia.

Psilocybe subfimetaria Guzmán & Smith sp. nov.

Pileus 8-12 mm latus, conicus demum campanulatus, viscidus, ochraceus demum ochraceobrunneus, tactu caerulescentes. Lamellae argillaceae, demum purpureobrunneae. Stipes 25-45 x 2-3 mm, aequalis ad basin subbulbosus, cavus, albidus vel pallidus, tactu caerulescentes; vellum sericeofibrillosum. Sporae (9.9-)11-12 (-12.6) x 6.6-7.7 x 6-6.6 um, ± leviter compressae. Pleurocystidia nulla. Cheilocystidia 20-28 x 5-6.6 um, fusoide ventricosa, hyalina. Cuticula pileorum gelatinosa. Fibulae adsunt. Specimen typicum in Herb. Guzmán (ENCB) conservatum est; legit Vancouver, B.C., Canada 2 Nov. 1976, Guzmán 16677.

Pileus 8-12 mm broad, conic to campanulate or expanded -umbonate, smooth, when moist translucent-striate, viscid, ochraceous brown to straw color, bluing when touched or injured. Context white, odor and taste farinaceous, bluing where injured; KOH stainig cap surface brown, the context reddish brown; stipe negative.

Lamellae adnexed, clay color becoming violaceous brown, edges pallid or concolorous.

Stipe 25-45 x 2-3 mm, central, equal but with subbulbous base, hollow, white to whitish, slightly staining blue where touched. Veil present as a white-silky fibrillose layer forming a fibrillose zone or subannulus that is soon evanescent.

Spore print dark violaceous brown. Spores (9.9-) 11-12 (-12.6) x 6.6-7.7 x 6-6.6 um, in face view subelliptic, some symetric to subelliptic in profile, thick-walled, ochraceous brown in KOH, apical pore broad.

Basidia 22-33 x 8.8-11 um, 4-spored, hyaline subglobose to ventricose. Pleurocystidia none. Cheilocystidia 20-28 x 5-6.6 um, hyaline, lageniform, neck long and 1-2 mm thick; forming a sterile band on gill edge.

Subhymenium hyaline to yellowish, subcellular. Gill trama regular, hyphae ± hyaline. Cuticle of pileus an ixocutis; hypodermium of elongate hyaline hyphae. Clamp connections present.

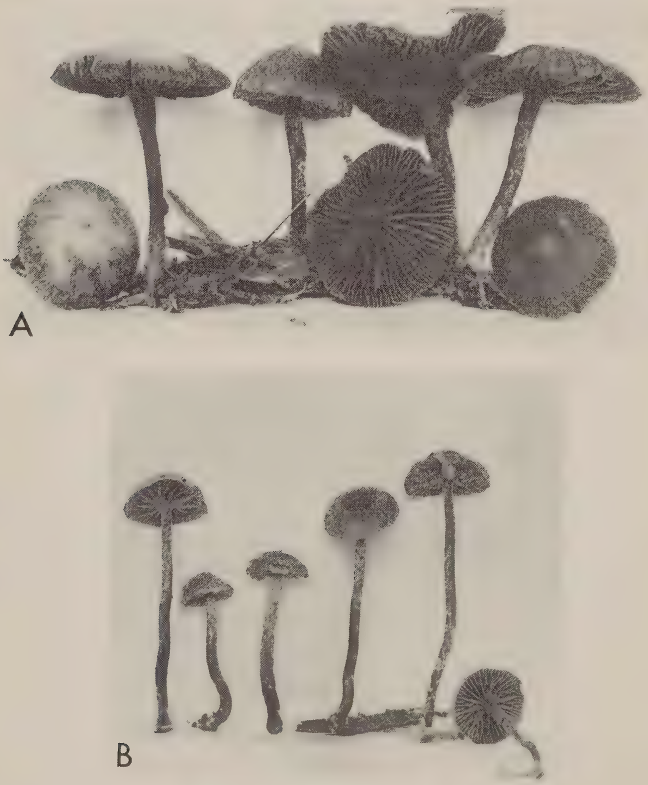

PLATE I.

A. *Psilocybe laticystis* x 1, Smith 71298.
B. *Psilocybe subborealis* x 1, Smith 54068.

Habitat and distribution. Solitary to gregarious on dung in meadows and other grassy areas. Known only from Vancouver, B.C., Canada and from Oregon in the United States.

Material studied. CANADA. Vancouver City, 2 Nov., 1976 Guzmán 16677 (type, ENCB: isotype MICH); Guzmán 16629 (ENCB). U.S.A. Oregon, near Siltcous Station, 4 Nov. 1976, Guzmán 16665 (ENCB); Lane County, Dune City, Oct. 1977, Menser 859 (ENCB); 16 Nov., 1976, Leslie 3929 (ENCB).

Discussion. A species close to *P. fimetaria* (Orton) Watling (see Orton 1964) for details of the annulus, habit and habitat, but *P. fimetaria* has spores 11-14 (-15.5) x 6.5-8.5 (-9.5) um as observed by Guzmán on the type (in E). It is also similar to *P. semilanceata* (Fr. ex Secr.) Kumm. with spore size (11-) 12-14 (-15.5) x 7-8 um, according to several collections studied by the authors from Europe and the Northwest. *P. semilanceata*, however, has a more umbonate or papillate pileus, poorly developed veil, and grows on soil. *P. pelliculosa* (Smith) Singer & Smith is closely related with *P. subfimetaria*, but grows on debris and humus in conifer forests, and has spores (8.2-) 9.3-11 (-12) x 5-6 um; its veil is poorly developed to rudimentary. From *P. liniformis* Guzmán & Bas (1977) it differs in the form of the pileus, in the spores (12-) 13-14.5 (-16.5) x 7.5-10 um, and in the absence of a veil. *P. subfimetaria* is an hallucinogenic fungus. Leslie found that it contained psilocybine

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# A NEW SPECIES OF PSILOCYBE (BELONGING TO THE P. CROBULA-GROUP) FROM ARGENTINA

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Studying material of *Psilocybe* collected by E. Horak in Argentina in 1962, the senior author found an interesting new species which at the first look tentatively was identified as *P. alnetorum* (Sing.) Sing. Due to the presence of pleurocystidia, however, this new species differs from the before mentioned species. The context of the species here described is not bluing and we assume that this fungus is not hallucinogenic. Together with this new record so far about 25 species of *Psilocybe* are known from Argentina. However, only 6 taxa are hallucinogenic or suspected to be so (Guzmán, 1978). Taking into account the fact that nowadays about 180 species are considered to belong to *Psilocybe* (Guzmán & Vergeer, 1978), this genus is abundantly represented in Argentina.

*Psilocybe subalnetorum* Guzmán & Horak, sp. n.

Pileo 10-12 mm, conico vel campanulato, umbrino. Lamellis adnato-subdecurrentibus, argillaceis. Stipite 20-25 x 1-1.5 mm, pileo concolori, minute fibrilloso,cortina nulla. Caro haud cyanescenti. Sporis 6.6-7.7/4.4-5.5 um, subrhombicis, levibus, tenuitunicatis, poriferis. Pleurocystidiis 16-38/11-16 um, raris, vesiculosis vel pyriformibus, mucronatis, plus minusve hyalinis. Epicute ex hyphis cylindricis subgelatinosisque cutem formantibus, membranis pigmento incrustatis, fibuligeris. Inter detritum sub Alni jorullensis. Argentina. Typus ZT, 66/476.

Pileus 10-12 mm broad, conic to campanulate, subumbonate, smooth but striate towards the margin when moist,dry, covered with concolorous fibrils, dark brown when moist, hygrophanous, drying yellowish. Lamellae broadly adnate to subdecurrent, argillaceous to pale rust brown, edge concolorous. Stipe 20-25 x 1-1.5 mm, cylindrical, flexuous, concolorous with pileus, covered with minute fibrils, dry hollow. Context probably concolorous with pileus, not bluing. Odor absent; taste not checked.

Spores 6.6-7.7 (-8.8) x (3.8-) 4.4-5.5 um, subrhombic or rhombic-elliptic in face view, subelliptic in side view, smooth, thin walled, brownish yellow, with a broad germ pore. Basidia 15-25 x 5-6 um, 4 spored, hyaline, vesiculose or subcylindric. Pleurocystidia 16-38 x 11-16 um, rare, hyaline, or some with a yellowish pale diffused pigment, broad vesiculose-pyriform, frequently mucronate; the mucron or neck is cylindric or moniliform, 4-7 x 2-4 um. Cheilocystidia 16-25 x 5-7 um, hyaline, narrow ventricose and mucronate or with short neck 3-4 um diameter. Subhymenium consisting or irregular small and globose hyaline cells whose walls are here and there irregularely encrusted with yellowish brown pigment, occasionally forming false pseudochrysocystidia in the hymenium (as in P. montana (Pers. ex Fr.) Kummer). Trama consisting or parallel hyaline hyphae (3-20 um diam.), membranes irregularely encrusted with yellowish brown pigment. Epicutis a thin subgelatinous layer of elongated hyphae. Hypodermium towards surface with similar structure as trama but deeper layers formed by thick hyaline hyphae. Clamp connections present.

Habitat and distribution: Gregarious among litter of Alnus jorullensis. Known only from the type locality.

Material studied: ARGENTINA, Prov. of Tucuman, Sierra de San Javier, San Agustín, March 3, 1962, Horak 66/476 (Type ZT, Isotypes BAFC and ENCB).

Discussion. Psilocybe subalnetorum Guzmán & Horak is closely related with P. alnetorum (Sing.) Sing. and P. cokeriana Smith & Hesler, differs, however, concerning the pleurocystidia. In the latter two species the pleurocystidia have an hyaline and refringent central oil drop like the chrysocystidia, as the senior author studied in the types (in BAFC & MICH). P. subalnetorum is also close to P. pyrispora (Murrill) Smith (from New York City, USA) (type in NY studied by the senior author); but the pleurocystidia of that species are always hyaline and further-more a mucronate apex is usually absent, or, if present, the neck does not exceed 3 um in length. In all four taxa mentioned here the size and shape of the spores and fruit bodies are alike, and they belong to the P. crobula-group.

## Literature Cited

Guzmán, G., 1978. The species of Psilocybe known from Central and South America. Mycotaxon 7 (in press).

Guzmán, G. and P.P. Vergeer, 1978. Index of taxa in the genus Psilocybe. Mycotaxon 6: 464-476.

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# REVUE DES LIVRES

par

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BIBLIOGRAPHIA SOCIETATUM LICHENORUM, par Chantal DELZENNE-VAN HALUWYN, in Bibliographia Phytosociologica Syntaxonomica, par R. TUXEN, édit., Suppl. 1, 177p., in 8°, 1977. J. Cramer, FL 9490 Vaduz. Prix DM 35.- , souscription DM 30.-.

Ce livre est un index des noms de taxa lichénosociologiques connus à ce jour, accompagnés d'une référence abrégée au protologue. Cet index est suivi d'une liste de la littérature à laquelle se réfère l'index. Le livre est présenté sans intoduction qui aurait permis de le situer comme supplément de la Bibliographia phytosociologica syntaxonomica et d'expliquer la méthode suivie, les abréviations et les signes adoptés. De plus l'absence complète de titres et de pagination des articles repris dans la liste bibliographique rend difficile, sinon impossible, la demande de cette littérature en bibliothèque.

FOURTH FEMS SYMPOSIUM. FEDERATION OF EUROPEAN MICROBIOLOGICAL SOCIETIES. VIENNA, MARCH 28 - APRIL I, 1977. ABSTRACTS. 140 p., in 8°, 1977. Publ. FEMS, Institut für angewandte Mikrobiologie, Universität für Bodenkultut, Peter Jordan Strasse 82, 1190 Wien, Austria. Prix Schillings 150.-.

Les quatre vingt sept communications présentées durant ce symposium ont toutes été consacrées aux champignons filamenteux, ascomycètes et basidiomycètes, à leur différenciation morphogénétique, leurs mécanismes biochimiques, leurs conditions optimales de culture, leurs métabolites et leur utilisation dans les industries biologiques de biosynthèse et d'épuration. Le systématicien, préoccupé d'observer la morphogénèse des espèces en culture pure, trouvera ici une source féconde de données.

MYCOLOGIE ET PATHOLOGIE FORESTIERES. II. PATHOLOGIE FORESTIERE, par L. LANIER, P. JOLY, P. BONDOUX et A. BELLEMERE, 478 p., 43 fig. 52 tabl., 2 pls. col. , in 8°, cartonné, toilé, 1976. Masson, 120 Bd Saint Germain, 75280 Paris.

Alors que la première partie est encore en préparation, la seconde partie est un traité, complet en soi, de pathologie forestière. Les auteurs d'abord passent en revue les diverses causes pathogènes, la symptomatologie, le parasitisme et les divers équilibres hôte-parasite. Dans le but de définir l'arbre sain, ils décrivent longuement la mycorrhisation et en soulignent l'importance. Les maladies physiologiques d'ordre écologiques ou telluriques sont décrites. Une distinction claire est faite entre les maladies de pépinières, les attaques sur pied (pourridiés) et les altérations du bois par les champignons lignivores. Un chapitre est consacré aux bactérioses et aux viroses. Enfin, la description méthodique de toutes les maladies de chaque essence forestière couvre quelque 200 pages, où les maladies fongiques sont parmi les plus importantes et les mieux documentées.Ce livre constitue le seul traité de pathologie forestière de langue française et approprié aux forêts d'Europe.

ANNUAL REVIEW OF PHYTOPATHOLOGY. VOL. 15. par K. F. BAKER, G. A. ZENTMEYER et E. B. COWLING, éditeurs, 499 p., in 8°, cartonné, toilé, 1977. Annual Reviews Inc., 4139 El Camino Way, Palo Alto, California 94306, USA.

En tête de ce volume, hommage est rendu au Dr. Philip H. Gregory, qui dans un chapitre "Spores in air", retrace les développements de l'aérobiologie et son importance dans l'épidémiologie des maladies des plantes et des animaux. Maxwell et collaborateurs montrent l'importance des "microbodies in plant pathogenic fungi" et chez les champignons en général comme étant le siège d'accumulation d'enzymes particulières nécessaires dans la transformation de substances non-glucosiques; ces "microbodies" sont connus comme corps de Woronin, corps de Stüben, glyooxysome, peroxisome, cytosome etc. Par ailleurs, J.M. Trappe fait une évaluation des possibilités d'inoculation de diverses espèces de champignons mycorrhiziens en pépinières forestières. Caten et Day, dans "Diploidy in plant pathogenic fungi" analyse la position de la diploïdie sexuelle dans le cycle vital et sa durée, l'isolement de diploïdes somatiques et les mécanismes de formation de noyaux diploïdes. Notons enfin l'étude de Griffin sur la relation entre la croissance des champignons lignivores et la teneur en eau dans le bois.

DEMONSTRATIONS MYCOLOGIQUES, par G.L. HENNEBERT, Document de biologie ouverte n° 5, 97 p., 81 figs., in 8°, 1977. Publ. de Biologie Ouverte, A. Bouillon, Croix du Sud 5, 1348 Louvain-la-Neuve, Belgique. Prix FB 50.-.

Exposé méthodologique de démonstrations ayant les champignons pour objet et destinées à l'enseignement préuniversitaire ou universitaire de niveau sous-gradué, dans le cadre des cours de biologie générale, de cryptogamie et de microbiologie. Sans ambition de couvrir tous les aspects de la mycologie, ni d'approfondir une connaissance systématique des champignons, ce livre veut introduire l'étudiant aux principales techniques microbiologiques qui lui permettront d'observer et de cultiver les champignons et en particulier les levures et les moisissures.

INTRODUCTION TO BIOLOGICAL SCANNING MICROSCOPY, par M.A. HAYAT, 323 p., 54 figs., in 8°, 1977. University Park Press, Chamber of Commerce Bld, Baltimore, Md 21202, USA. Prix $ 14.95.

L'auteur, une autorité en ce domaine, expose de manière simple et concise autant les méthodes de routine que les méthodes nouvelles ou modifiées utilisées dans la microscopie SEM d'objets biologiques. Il en compare les avantages et les inconvénients, dans le but de recommander celles qui permettent d'atteindre les meilleurs résultats dans l'observation de la topographie des cellules et des tissus. Le livre, bien qu'adapté au non-initié, eut été plus démonstratif s'il eut été plus abondamment illustré. Ce livre sera certainement utile au mycologue ayant accès à un équipement SEM.

OPERE DI LOUIS PASTEUR, par Onorato VERONA, trad. et introd., in Coll. Classici della Scienza, L. Geymonat, édit., 1024 p., 10 pls. hors texte, relié, 1972. Unione Tipografico Editrice Torinese, Torino, Italia. Prix Lo 15,000.-.

L'oeuvre de Louis Pasteur ne peut être oubliée. Les études de Pasteur sur les ferments de la bière et du vin, qui l'ont conduit à mettre au point la méthode des cultures pures (axéniques) et de la stérilisation par la vapeur, ont permis non seulement une réfutation indiscutable des théories fantaisistes des "polymorphistes" mais aussi la défense des principes taxonomiques dans la distinction des espèces des champignons par leur culture en milieux normalisés. C'est de cette dette que nous devons à Pasteur que le Professeur Verona s'est admirablement acquitté en traduisant et en commentant dans sa langue les oeuvres du savant français, qu'il présente dans un livre richement relié.

## REVIEWERS

The Co-Editors express their appreciation to the following individuals who have reviewed one or more of the papers in this volume prior to publication.

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## ERRATA (VOLUME 6)

Page 220, lead 18(17): for *broteriana* read *albo-velatum*
420, line 18: *for* Susan M. Gruff *read* Susan C. Gruff
*Spine* 6(3): *for* October-December 1977 *read* January-March 1978

## ERRATA (VOLUME 7)

Page 47, line 45: for *glabratula* (Lamy) read *glabra* (Schaer.)
73, 49: for *emeleia* read *emileia*
76, 22: for *apiculata* read *apiculatula*
79, 14: for *O. auricula* read *Otidea auricula*
81, 1: for *crouani* read *crouanii*
17: for *cervina* read *cervaria*
34: *for* TU *read* UT
83, 41: for *persoonia* read *persoonii*
45: for *plachonis* read *planchonis*
84, 34: for *umbrarum* read *umbrorum*
85, 33: for *stercorius* read *stercoreus*
53: for *boudierii* read *boudieri*
165, 28: for *echinata* read *echinatum*
29: for *echinatum* read *echinata*
210, 1: *for* uniserriate *read* uniseriate
228, 25: *for* HOOGSHAGENI *read* HOOGSHAGENII
239, 31: for *weldeni* read *weldenii*
321, 28: for *Scirrophragma* read *Scirrhophragma*
324, 14, 20, 21: for *pulchellus* read *pulchella*
345, 42: for *saepiarium* read *sepiarium*
400-408 (throughout): *for* Raitvǐir *read* Raǐtviǐr
534, col. 2: *under* Peziza *add* domiciliana 73;

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